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# Developing a Repeatable Methodology to Calculate Retrograde Planning Factors

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## Preface

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To field a force capable of efficient and continuous two-way operations, the Army must have a process for accurately planning the movement or return of serviceable and unserviceable materiel back through the distribution system. Bottlenecks and stockpiles should be minimized, in-demand unserviceable items should be rapidly repaired when economically appropriate, and the support footprint should be optimized.

Accurate retrograde planning factors, based on actual contingency operations, enable retrograde planning and thereby help ensure retrograde capabilities are considered in the force flow. To derive these factors, first, data sources for measuring the retrograde flow of Army materiel and supplies from forward operating units to intermediate bases, the theater support base, and to the continental United States must be found. Second, retrograde requirements must be identified and documented. Lastly, a reliable methodology for deriving retrograde planning factors must be established and maintained.

An Arroyo project, “Retrograde Planning Factors Derived from Current Operations,” set out to establish a repeatable methodology for developing and maintaining retrograde planning factors to assist logistics planners in calculating retrograde estimates for multiphase operation plans and operation orders.

This report describes the development of that methodology and presents updated retrograde planning factors resulting from its application. The body of this report should be of interest and utility to Army logisticians and leadership involved in retrograde or determining support force structure requirements. A more-technical audience will be particularly interested in the appendixes, which include data definitions, tables of organizational elements, and detailed planning factors.

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# Summary

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## Overview

To plan for and field a force capable of efficient retrograde operations, the Army must possess accurate planning factors to estimate retrograde workload, including turn-in, classification, preparation, packing, transportation, and shipping of materiel. Unfortunately, in operations over the past decade, the flow of retrograde has been untimely, and the Army had difficulty eliminating the resulting continuous backlog of retrograde. This indicated that the Army has underresourced organizations involved in retrograde operations, in part because of inadequate retrograde planning factors.

The Army's Deputy Chief of Staff, Army Logistics (G-4) along with the Army's Combined Arms Support Command recognized the opportunity to accurately assess the resources required to execute the retrograde process and asked RAND Arroyo Center to recommend a repeatable methodology, based on current retrograde operations, for developing retrograde planning factors for the use of the Deputy Chief of Staff, Programs (G-8) Center for Army Analysis in Total Army Analysis modeling.

This document proposes a methodology for developing retrograde planning factors and outlines the five steps the team took:

- map the current retrograde process in Iraq and Afghanistan to identify all work activities
- determine data sources to measure retrograde workload and identify data gaps
- develop repeatable method to generate accurate planning factors
- speak with subject matter experts to assess shortcomings in data and gather insights regarding strengths and weaknesses of the current retrograde system
- implement method and generate planning factors.

By incorporating actual data from operations Iraqi Freedom (OIF), New Dawn (OND), and Enduring Freedom (OEF), the methodology provides accurate planning factors and ensures improved workload estimates. While earlier efforts measured possible retrograde workload as a percentage of the weight of materiel issued only to units, the proposed methodology considers materiel from all sources. In doing so, this approach encompasses many different causes of retrograde not captured in previous estimates, including local excess, authorized stockage list (ASL) reviews, materiel found on installation (FOI), maintenance, redeployment, and captured enemy materiel.

By capturing actual wartime requirements and fully incorporating all retrograde, this report showed the extent to which retrograde planning factors had been systematically and substantially underestimated. By weight, approximately one-half of retrograde for repairable items and nearly all retrograde for nonrepairable items is caused by supply chain inefficiencies, changes in demand

rates, operational tempo, task force organization, drawdown, and redeployment, for which the workload had previously not been captured in the retrograde planning factors. By capturing total workload associated with retrograde, retrograde planning factors increased considerably.

Moreover, the report dispels the notion that retrograde can be reliably measured without reference to associated unit demands. Historically, retrograde planning factors have been expressed in units of pounds or gallons per soldier day or of standard requirement code (SRC) day. Daily retrograde quantities per soldier or SRC vary widely depending on the nature of the conflict, operational tempo, and other wartime variables. For example, over the time frame studied, Iraq produced significantly more retrograde weight per soldier day than Afghanistan did because of the different brigade types present and the differing equipment densities within brigades.

Theater, theater development, and unit type variances can be eliminated by calculating retrograde as a percentage of customer issues, which are naturally highly sensitive to equipment types and equipment density and accordingly correlate closely with retrograde. Retrograde planning factors determined as a percentage of customer issues provide a path toward an accurate measure of retrograde into the Total Army Analysis process.

Last, the report captures the roles of many non doctrinal elements, such as the regional retention supply support activities (SSAs) and the theater ammunition reclamation facility, that augmented, and in many ways made up, the retrograde distribution system in OIF and OEF. These elements, along with a myriad of associated informal relationships, help form the backbone of reverse logistics but have often not been formalized anywhere in doctrine and have instead been established ad hoc to fill wartime need. These organizations and associated lessons learned are ideal candidates for inclusion in doctrine to improve retrograde modeling within Total Army Analysis.

## Results

While the immediate output of this effort was a series of retrograde maps and associated retrograde planning factors, by class and phase, many tangential outcomes will also be of interest to logisticians. In this report, the reader will find a mapping of the retrograde distribution system, an overview of responsible organizations, a listing of relevant doctrine (found in Appendix K and the references), and peer insights regarding the strengths and weaknesses of the OIF/OND and OEF retrograde system. The reader will also find many insights into the nature of retrograde and its causes, most notably the effect of supply chain inefficiencies on serviceable retrograde.

It should be noted that, because of data limitations, Class VII retrograde planning factors were not included. While an approximate estimate for the overall size and pace of Class VII withdrawal from Iraq was approximated, no repeatable Class VII methodology could be developed. Classes I, VI, X, and XIII were also not included because they are not retrograded frequently.

## *Key Support Activities*

The key activities that compose the retrograde process are best broken down according to the Standard Army Information System they use and Classes of Supply they support (see Table S.1).

Utilizing Standard Army Retail Supply System and supporting Classes of Supply II, IIIIP, IV, and IX are the theater SSA, regional retention SSAs, and tactical SSAs, ordered from the highest level of aggregation to the lowest. Similarly ordered, the theater storage area (TSA), ammunition supply points (ASPs), and ammunition transfer holding points (ATHPs) use Standard Army Ammunition System Modernization and supporting Class V.

While Classes II, IIIIP, IV, and IX are generally delivered directly from the source of supply to the supporting tactical SSA, in reverse, these classes generally pass through one or more intermediate SSAs en route out of theater. Ammunition, on the other hand, follows the same route, traveling either from the TSA to the ASP to the ATHP or the reverse.

In addition to the key support activities mentioned above, retrograde functions and necessary associated functions (such as inspections) are performed by a network of organizations and activities (see Table S.2).

**Table S.1. Support Elements**

<b>Element</b>	<b>Classes of Supply</b>	<b>Standard Army Information Systems</b>
Theater SSA	II, IIIIP, IV, and IX	Standard Army Retail Supply System
Regional retention SSAs		
Tactical SSAs		
TSA	V	Standard Army Ammunition System Modernization
ASPs		
ATHPs		

**Table S.2. Activities and Purpose**

<b>Organization or Activity</b>	<b>Purpose</b>
Maintenance	Materiel classification
Retrograde sort yards	Materiel sorting
Theater ammunition reclamation facility	Ammunition classification, sorting, and packaging
Redistribution property assistance teams	Class VII retrograde
U.S. Army Materiel Command	Disposition
U.S. military police	Customs Inspection
Central receiving and shipping points	Cross docking, consolidation and container management

## *Class IX*

Of the classes studied, Class IX, is the single largest contributor to retrograde because of the high incidence of reparable items and their large absolute weight. Most other classes (other than Class VII) are nonreparable (consumable) and therefore do not contribute significantly to retrograde. Tactical Class IX retrograde is equal to 78 percent of customer issues by weight and consists of 41 percent unserviceable and 37 percent serviceable materiel. Interestingly, Class IX serviceable retrograde is significantly higher than the 15-percent serviceable return rate (see Appendix E). Comparing materiel inflow to outflow from the SSA reveals that tactical SSAs receive the equivalent of 95 percent of customer issues weight in the form of serviceable SSA receipts from a supporting source of supply, 26 percent in serviceable FOI, and 15 percent in serviceable customer returns. In total, this is equal to 136 percent of customer issues weight. This emphasizes the reality that customer issues are not the only source of retrograde and largely explains the 37 percent serviceable retrograde rate. SSA receipts, FOI, and receipts from maintenance are three sources that had not previously been captured in retrograde estimates and which significantly drive serviceable retrograde. ASL changes (deletions and requisition objection decreases) also contribute to retrograde, a source that RAND's continuing support to the Army's Expert ASL Review Team at the Logistics Support Activity is working to minimize.

While the various phases of a given operation were not a major predictor of retrograde, likely because of careful attrition of items before or coincident with actual drawdown of forces, the establishment of repair and return-to-stock maintenance operations in theater caused theater SSA unserviceable retrograde levels to decline and serviceable retrograde levels to increase.

## *Classes II, IIIP, and IV*

Classes II, IIIP, and IV can be grouped together because the metrics are, for the most part, indistinguishable. For planning purposes, Class II, IIIP, and IV (non-Class IX) retrograde is strictly serviceable and is 23 percent of customer issues at the tactical level. While there were very limited amounts of unserviceable retrograde, these amounts are negligible and do not drive workload. Just as in the case of Class IX, studying the materiel inflow versus outflow of a tactical SSA for non-Class IX materiel, tactical SSAs take in 121 percent of customer issues as serviceable receipts (see Appendix F). This accounts for the relatively large percentage of serviceable retrograde.

## *Class V*

As with other classes, lower-level Class V organizations receive a consistent oversupply of materiel. Both ASPs and ATHPs received 123 percent of customer issues over time. While this study did not evaluate stock levels for Class V, it does appear that lower-level organizations are keeping this oversupply on hand, with ATHPs retrograding 10 percent of customer issues by weight and ASPs retrograding 4 percent. For ATHPs, retention of ammunition is not found in

doctrine but is consistent with the notion that retention keeps soldiers off the roads and out of harm's way, highlighting one of the many differences between stateside and wartime operations.

Turn-in rates were 8 percent higher at the ATHP than at the TSA or ASP. This likely resulted in the higher rate of retrograde back to the ASP. However, the ASP retained a large portion of serviceable retrograde and, for the most part, passed through only the unserviceable portion.

Estimates from the Iraq drawdown show a one-time spike in theater customer turns-ins and FOI, producing retrogrades of 51 and 53 million pounds, respectively, or about two years' worth of demand. Additionally, approximately one years' worth of demand (47 million pounds) was retrograded out of the TSA, and another one-fifth of a years' worth of demand (11.7 million pounds) was transferred to defense disposition services (and likely demilitarized in theater by ammunition specialists or explosive ordnance disposal).

### *Areas to Revisit*

While these factors represent a major step forward, there is still much work to be done. Due to lack of data, Class VII metrics were not captured,<sup>1</sup> and Class V metrics were based on a limited data set.<sup>2</sup> In studying the Afghanistan drawdown, Class VII can be captured more completely. In extending the data to include the final years of the Afghanistan conflict and the Afghanistan withdrawal, Class V can also be better addressed. The effect of Global Combat Support System–Army implementation on these factors has yet to be determined because the transactions that were used to derive these factors may be changed, eliminated, or added to.

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<sup>1</sup>By doctrine, Class VII is to be retrograded through a unit's supporting SSA. However, because of the scale of the Class VII mission, retrograde property accountability team yards and mobile teams were formed to handle Class VII retrograde, excluding Class VII retrograde from SARSS.

<sup>2</sup> Worldwide Ammunition Reporting System data are maintained for only three years.

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## Abbreviations

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AASA	Administrative Assistant to the Secretary of the Army
ABF	asset balance file
ADRP	Army Doctrine Reference Publication
AFSB	army field support brigade
AFSBN	army field support battalion
AMSAA	Army Materiel Systems Analysis Activity
AO	area of operation
AOR	area of responsibility
APHIS	Animal and Plant Health Inspection Service
ARCENT	U.S. Army Central Command
ASA	Ammunition Supply Activity
ASL	authorized-stockage list
ASP	ammunition supply point
ATHP	ammunition transfer holding points
ATTP	Army Tactics, Techniques, and Procedures
BCT	brigade combat team
BSB	brigade support battalion
C2	command and control
CAA	Center for Army Analysis
CASCOM	Combined Arms Support Command
CBP	Customs and Border Protection
CEA	captured enemy ammunition
CENTCOM	U.S. Central Command
COMSEC	communications security
CONUS	continental United States
COR	Contract officer representative
crsp	central receiving and shipping point
CSSA	consolidated supply support activity
CSSB	corps sustainment support battalion
CTASC	Corps/Theater Automated Data Processing Service Center
DA	Department of the Army
DDS	defense disposition services
DHS	Department of Homeland Security
DHS-CBP	Department of Homeland Security's Customs and Border Protection
DIC	document identifier code

DLA	Defense Logistics Agency
DOCNO	document number
DoD	Department of Defense
DODAAC	Department of Defense Activity Address Code
DODAAF	Department of Defense Activity Address File
DODIC	Department of Defense Identification Code
DS	direct support
DSA	division support area
DTR	Defense Transportation Regulation
FEU	40-foot containers
FOB	forward operating base
FOI	found on installation
FORGE	Force Requirements Generator
FSC	forward support company
GATES	Global Air Transportation System
GCC	geographic combatant commander
GCSS	Global Combat Support System
GLOC	ground line of communication
HLP	heavy-lift platoons
HN	host nation
ILAP	Integrated Logistics Analysis Program
ITV	in-transit visibility
LMP	Logistics Modernization Program
LOGSA	Logistics Support Activity
MCL	mission configurable load
MGRCDMRO	manager materiel release order code
MGT_CD	management code
NATO	North Atlantic Treaty Organization
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
NIIN	National Item Identification Number
NSL	nonstockage list
NSN	National Stock Number
OCONUS	outside the continental United States
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OND	Operation New Dawn
OPLAN	operation plan
OPORD	operation order

PBUSE	Property Book Unit Supply Enhanced
POD	point of debarkation
POE	point of embarkation
QSC	quartermaster supply company
RIC	routing identifier code
RL	retention level
RO	requisition objection
ROP	reorder point
RPAT	redistribution property assistance team or retrograde property accountability team
RSY	retrograde sort yard
SAAS-MOD	Standard Army Ammunition System Modernization
SAMS	Standard Army Maintenance System
SARSS	Standard Army Retail Supply System
SOS	source of supply
SRC	Standard Requirement Code
SSA	supply support activity
STAMIS	Standard Army Information System
STONS	short ton
SUST	sustainment brigade
TAA	Total Army analysis
TAMIS	Total Ammunition Management Information System
TARF	theater ammunition reclamation facility
TARP	Tire Assembly Repair Program
TC-AIMS II	Transportation Coordinators' Automated Information for Movement System II
TCN	third-country national
TEU	20-foot equivalent unit
TSA	theater storage area
TSC	theater sustainment command
USAMC	U.S. Army Materiel Command
USDA	U.S. Department of Agriculture
WARS	Worldwide Ammunition Reporting System

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## Class of Supply Definitions

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Class I	Subsistence; including health and welfare items
Class II	Includes clothing, individual equipment, tentage, tool sets and tool kits, hand tools, administrative supplies and equipment, and housekeeping supplies and equipment
Class IIIP	Packaged petroleum products; includes fuel in collapsible containers less than 500 gallons, and lubricating oil packed by manufacturer in containers of less than 55 gallons
Class IV	Construction materiel; includes all fortifications and barrier materials
Class V	All types of ammunition and related items; includes chemical, radiological, and special weapons
Class VI	Personal demand nonmilitary items
Class VII	Major end items of equipment; a major end item is a final combination of end products that is ready to use
Class VIII	Medical materiel; includes repair parts that are used only on medical end items
Class IX	Repair parts; includes kits, assemblies, subassemblies, and any item, repairable or nonreparable, that is needed to provide maintenance support to any equipment
Class X	Materiel used to support nonmilitary programs, such as agriculture and economic development; items that may be coded in another class will be assigned the other class

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## 1. Introduction

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The term *retrograde* is most succinctly defined as movement backward. However, in Army applications, retrograde concerns the return of materiel from the owning or using unit back through the distribution system to the source of supply, directed ship-to location, and/or point of disposal (Army Tactics, Techniques, and Procedures [ATTP] 4-0.1, 2011).<sup>3</sup> The retrograde process includes the activities of turn-in and classification, preparation, packing, transportation, and shipping of materiel and can take place as part of normal theater distribution operations or as part of redeployment operations.<sup>4</sup>

Effective retrograde planning is essential and necessary to preclude the loss of materiel assets, minimize environmental impact, and maximize use of transportation capabilities (Army Doctrine Reference Publication [ADRP] 4-0, 2012, para. 3-127). To plan and field a force capable of efficient two-way operations, the Army must possess accurate planning factors, by class of supply, to estimate the retrograde workload that will occur. Accurate retrograde planning factors ensure that the Army will be able to plan and resource adequate force structure, in terms of both (1) infrastructure to support a two-way flow of resources and (2) capability to move materiel through the distribution system to achieve time-definite delivery.

Currently, the Deputy Chief of Staff, Army Logistics (G-4), in coordination with the Army's Combined Arms Support Command (CASCOM), provides retrograde planning factors to the Deputy Chief of Staff, Programs (G-8) Center for Army Analysis. These factors are represented as a percentage of the total unit issues by class of supply (weight) for various operational scenarios and environments. These factors populate the Force Requirements Generator (FORGE) Model to inform Total Army Analysis modeling.

Unfortunately, operations over the past decade saw a backlog of retrograde, suggesting the need to develop retrograde planning factors and improved understanding of the resources required to execute the retrograde process as it is performed in combat operations. Although at the time of this writing, one contingency has completed and another one is nearing its end, an opportunity still exists to update the Army's retrograde planning factors by developing and implementing a repeatable and improved retrograde planning methodology.

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<sup>3</sup> The Army also uses the term *retrograde* to mean a type of defensive operation that involves organized movement away from the enemy (ATTP 3-90.4, 2011).

<sup>4</sup> ATTP 4-0.1, 2011, para. 3-50:

Retrograde operations will take place as a normal part of theater operations and as part of redeployment operations. When designated by the GCC or upon completion of theater operations, units, personnel and equipment will become part of retrograde operations. At a minimum, successful retrograde operations should cover two areas: classes of supply/consumable items and cargo/equipment.

The Army G-4 and CASCOM recognized the opportunity and asked RAND Arroyo Center to develop and recommend a repeatable methodology for developing retrograde planning factors based on a review of the current retrograde process. To update the methodology, researchers at RAND undertook five steps. First, they mapped the current retrograde process. Second, they compared the current retrograde process, as stipulated in doctrine, to actual retrograde operations in Iraq and Afghanistan. Third, having developed an accurate process map, they determined the data sources required to measure the process and identified data gaps. Fourth, they held discussions with supply officers to gain valuable insight into what is happening on the ground to reveal any weaknesses or omissions in the data. Fifth, they developed and implemented a retrograde planning methodology.

Implementation of the updated methodology resulted in a series of new retrograde planning factors. The planning factors are stated as percentage of forward flow and thus are constant with respect to changes in demand across time and in different environments. The new retrograde planning factors yield estimates higher than the current factors. This is because they pay particular attention to the tasks required for retrograde and the associated force structure requirements. The new planning factors appear in Appendixes E through I.

## Organization of the Report and Its Intended Audience

This document should be of interest and utility to Army logisticians and leadership involved in retrograde or determining support force structure requirements. Section 2 defines retrograde and explains roles and associated functions. Section 3 describes the theater retrograde structure in Iraq and Afghanistan. Section 4 explains the data used in this report. Section 5 describes development of the methodology. Section 6 provides results. Last, Section 7 discusses the results based on feedback from supply officers and suggests areas for revisit and revision.

A more technical audience will be particularly interested in the appendixes, which include data definitions, tables of organizational elements, and detailed planning factors.

## 2. Definitions

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For each class of supply, retrograde operations are principally defined by source, destination, and activities involved. These three aspects, in combination with volume, define the type and amount of force structure required to effectively perform two-way operations.

To develop retrograde planning factors, RAND Arroyo Center researchers first defined the retrograde process across the three aforementioned aspects and for the classes of supply for which retrograde occurs.

### Defining Retrograde

ATTP 4-0.1 (2011) defines *retrograde of materiel* as “the return of materiel from the owning/using unit back through the distribution system to the source of supply, directed ship-to location and/or point of disposal.” While this definition represents part of retrograde, it narrows the source of materiel and equipment only to items returned from an owning or using unit. In practice, retrograde can result from other sources as well: returns; local excess; authorized-stockage list (ASL) reviews; found on installation (FOI); maintenance; redeployment; and, in the case of ammunition, captured enemy ammunition.

While approximately one-half of retrograde for repairable items by weight is caused by returns from units, other sources contribute the bulk of retrograde for nonrepairable items. One possible explanation for this, and an explanation that will be outlined more completely later, is that supply support activities (SSAs) receive an oversupply of materiel over time when compared to their customer issues. This oversupply can result from a range of sources including multiple receipts from wholesale, customer cancellations, FOI, and customer returns.

To account for the many sources of retrograde, this report stipulates a definition more expansive than the doctrinal definition. Here, *retrograde* is defined as the movement or return of serviceable and unserviceable materiel back through the distribution system to the designated ship-to location, repair facility, or point of disposal for the purposes of credit, certification, reworking, recouping, restocking, or disposal.

This expansive definition is consistent with the other doctrinal statements that “retrograde operations will take place as a normal part of theater operations and as part of redeployment operations” and that “at a minimum, successful retrograde operations should cover two areas: classes of supply/consumable items and equipment” (ATTP 4-0.1, 2011, para. 3-50).

### Retrograde Functions

The five basic retrograde functions (ADRP 4-0, 2012, para. 3-127) and their associated subfunctions are as follows:

- **Turn-in:** classification, identification and condition coding
- **Preparation:** inspection, certification, draining, washing, and the request for disposition instructions
- **Packing:** acquiring and maintaining packing materials to be used in retrograde operations, packing
- **Shipping:** movement, cargo handling and documentation
- **Transporting:** ground, air and seaport embarkation.

## Classes of Supply and Equipment

Army materiel is divided into ten classes of supply. While most of the analysis in this report will focus on materiel other than end items, Class VII is also prepared for retrograde and inspected in theater at redistribution property assistance team (RPAT) yards.<sup>5</sup> Class VII will be discussed briefly in Section 7, and RPAT is discussed in Appendix J.

### *Retrograde Materiel According to Doctrine*

This section describes Army policy on the disposition of various supply classes. Certain classes of supply are more likely to be returned and retrograded. Likewise, different classes of supply are more or less likely to receive a particular disposition, whether it is a designated ship-to location, repair facility, or point of disposal. Table 2.1 and the following paragraphs summarize ATTP 4-0.1 2011), paras. 3-53 to 3-62, and provide additional detail for each class.

**Table 2.1. Class of Supply Chances of Return and Likely Disposition**

Class	Description	Likelihood of Return	Likely Disposition
I	Subsistence	Low	N/A
II	Clothing, individual equipment, tools, administration supplies	Low	DDS
III	Petroleum, oils, lubricants	Limited IIIP	DDS
IV	Construction materials	Low	Host nation or DDS
V	Ammunition	High	Stock
VI	Personal demand items	Low	N/A
VII	Major end items: racks, pylons, tracked vehicles, etc.	High	Stock
VIII	Medical materials	Low	Stock
IX	Repair parts	High	Stock
X	Materiel for nonmilitary programs	Low	Host nation

SOURCE: ATTP 4-0.1 (2011d), paras. 3-53 to 3-62.

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<sup>5</sup> The RPAT, also called redistribution property accountability team, is a nondoctrinal team consisting of soldiers, contractors and DA civilians that was established in Iraq and Afghanistan to relieve units of equipment and assist in the retrograde process.

Of the ten classes of supply, only Classes V, VII, and IX are likely to be returned and retrograded in great quantity:

- Class I is unlikely to be retrograded.
- Class II is often bulky and usually low cost and is unlikely to be retrograded or returned for economic reasons. Class II will either be consumed or transferred. In the case of uniforms with “friend or foe” technology, demilitarization prior to transfer to defense disposition services (DDS) may be required.
- Of Class III, only III(P), Petroleum, is likely to be retrograded. Bulk Class III will either be disposed of or redistributed. Class III carries unique environmental and hazardous waste concerns. Accordingly, trained personnel or licensed contractors are required for its disposal.
- Class IV will not generally be considered for retrograde or redeployment and will likely be transferred to other military activities or DDS for disposal. In 2008, there was a significant spike in Class IV retrograde in Afghanistan. This retrograde will be discussed in Section 5 but was entirely within country and was largely caused by a change in property accountability.
- While most unserviceable Class V ammunition may be retrograded for demilitarization and disposal action or destroyed locally with host nation agreement, some Class V will be considered for retrograde. This is true for both U.S. munitions and captured enemy ammunition.
- Class VI materiel is not considered for return or retrograde unless status-of-forces agreements or other host-nation agreements require turning it in to DDS for disposal.
- Class VII is retrograded to maintenance during normal operations and to the designated ship to location during redeployment. Some Class VII may be transferred to disposal for demilitarization or destruction.
- While some Class VIII is eligible for retrograde, either to DDS or back to the prime vendor, this quantity is very small. For the sake of developing retrograde planning factors, Class VIII is not considered retrogradeable.
- Class IX represents over 50 percent of retrograde received at tactical SSAs and an even higher percentage of retrograde transferred to the theater SSAs. All local serviceable excess and repairable items are reported to the materiel manager and are either redistributed or retrograded.
- Class X materiel is normally not returned once transferred to the designated recipient.

### *Retrograde Materiel in Practice*

It is often contended that Classes II, IIIIP, and IV are not retrograded, and indeed, they are retrograded in much smaller quantities than Class IX; however, Classes II, IIIIP, and IV showed noticeable amounts of retrograde in both the Operation Iraqi Freedom–Operation New Dawn (OIF/OND) and Operation Enduring Freedom (OEF) contingencies. Table 2.2 provides the top five National Item Identification Numbers (NIINs) by class that contributed to tactical SSA retrograde over the course of the conflict. Not surprisingly, the largest in terms of volume are Class IV and IX NIINs.

**Table 2.2. Top Five Retrograded National Item Identification Numbers, by Class**

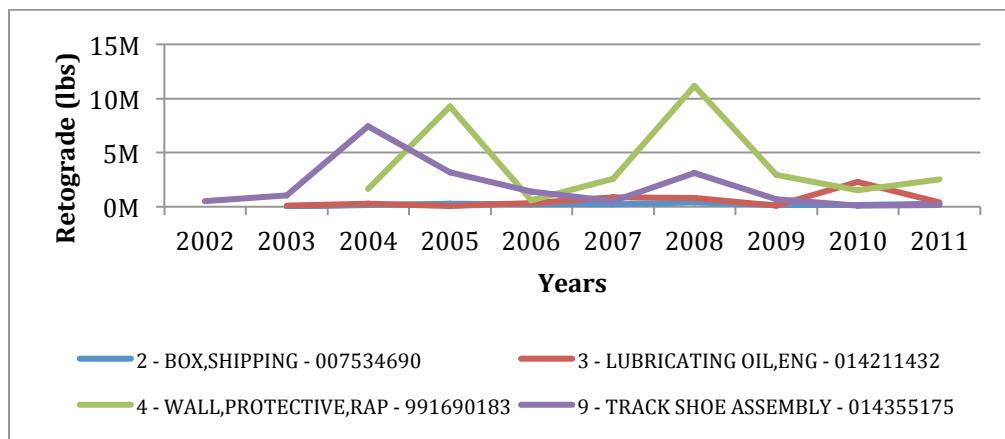
<b>Class</b>	<b>Nomenclature</b>	<b>NIIN</b>	<b>Weight (lbs.)</b>
II	Box, shipping	007534690	1,888,800
	Locker, clothing	005507024	1,746,225
	Sleeve, box	014440198	1,724,000
	Glass, ballistic grade	015333758	1,698,938
	Cot, folding	009350422	1,689,100
IIIP	Lubricating oil, engine	014211432	5,222,150
	Lubricating oil, aircraft turbine mil-I	006815999	1,973,940
	Dust control agent	014931749	1,882,900
	Hydraulic fluid, automatic transmission	011149968	1,828,261
	Antifreeze	014649152	1,808,748
IV	Wall, protective, rapid assembly	991690183	32,321,250
	Lumber, softwood, dimension	014334275	25,823,372
	Barbed wire	002248663	13,285,624
	Bag sand MIL52472T1-2	001429345	10,569,738
	Plywood, construction	001297833	10,391,290
IX	Track shoe assembly	014355175	18,105,760
	Track shoe, vehicular M2/M3	014429686	7,807,565
	Track shoe, vehicular M88 medium	006929316	5,750,393
	Tire, pneumatic, vehicular 16.00R20	013342694	5,331,330
	Parts kit, track pad	012953112	3,619,007

The quantities of the top NIINs in each of the four classes that Corps/Theater Automated Data Processing Service Center (CTASC) covers vary depending on operational drivers (see Figure 2.1).

As noted previously and as will be discussed further, a large spike occurred in Class IV in 2008 as that materiel was recorded in the Standard Army Retail Supply System (SARSS) stock record account. The cause of the 2005 spike is somewhat less clear. The 2004 Class IX spike is due to an influx of M1 tank track shoe assemblies.

As is illustrated, Classes II and IIIP did not see anywhere near the volume that Classes IV and IX did. However, there was an increase in lubricating oil in 2010 that was most likely related to the withdrawal from Iraq and the associated shutdown of SSAs.

**Figure 2.1. Top Retrograded NIIN for Each Class in SWA**



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### 3. Army Theater Retrograde Structure in Southwest Asia and Associated Organizations

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Retrograde activities are performed by a network of organizations and entities, beginning at the lowest point of consolidation, either the SSA or ammunition supply point (ASP), and extending through organizations that include transportation companies, retrograde sort yards (RSYs), RPATs, the theater ammunition reclamation facility (TARF), and central receiving and shipping points (CRSP).<sup>6</sup> This section describes the Army theater retrograde structure in Southwest Asia and the organizations associated with it.

#### Retrograde Organizations

Doctrinally, for sustainment materiel, the SSA classifies, prepares, packages, documents, labels, and produces radio frequency tags for retrograde items. For ammunition (Class V), the ASP and then ultimately the TARF do the classification, preparation, and packing. For major end items (Class VII), the RPAT yard performs classification and preparation. Transportation companies then move materiel to the next stage of evacuation.

The role of U.S. Army Materiel Command (USAMC) is to coordinate, monitor, control, receive, account for, and arrange the retrograde shipment of Army equipment and weapon systems when released by the geographic combatant commander.<sup>7</sup> Major end items returning to the United States must undergo agricultural and customs inspection and certification. This may occur at the origin instead of at the U.S. border and is typically performed by U.S. military police or analogues in place of U.S. Department of Agriculture (USDA) and U.S. Department of Homeland Security's Customs and Border Protection (CBP) inspectors.<sup>8</sup> Army doctrine states

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<sup>6</sup> The CRSP is a doctrinal function performed by the sustainment brigade and described in FM 4-93.2 (2009).

<sup>7</sup> According to ATTP 4-0.1 (FM 101-1-1), 2011, para. 2-43, USAMC

coordinates, monitors, controls, receives, accounts for, and arranges the retrograde shipment of Army equipment and weapon systems when released by the geographic combatant commander. This includes inspection, condition coding, repackaging, preservation, marking, coding, documentation, loading, and accountability to ensure the orderly and timely retrograde movement of all materiel and munitions no longer required in the area of operation (AO).

<sup>8</sup> U.S. Transportation Command, 2011, Ch. 505 states:

It is the policy of the DOD that all organizations and personnel involved in the movement of DOD-sponsored cargo, personal property, and accompanied baggage will take those steps necessary to prevent the spread of agricultural pests. This includes movement not only across national borders, but any movement that has the potential to introduce invasive species to a new area. It includes shipments from DOD installations and vendor locations by both military and commercial carriers.

Chapter 506 addresses DOD preclearance program customs and agriculture inspections.

that meeting CBP and USDA standards is the obligation of the theater Army.<sup>9</sup> Evidence from the theater suggests that military police trained regional retention SSA personnel in Afghanistan to perform customs preclearance (ATTP 4-0.1, 2011d).

The final step out of theater is the CRSP, which performs final preparation of materiel for move out of theater, including loading of materiel. The CRSP then transfers it to shipping and/or port operations. Port operations perform many of the same functions as CRSP and will discharge or load containers, load or unload wheeled or tracked vehicles for surface movement, break-bulk cargo, and perform safety inspections for air cargo.

In addition to these formal relationships and partly as a result of the relatively sparse doctrine related to retrograde, there are many informal relationships that, in many ways, form the backbone of the retrograde process. The most noticeable example is the SSA's reliance on the Brigade Support Battalion (BSB) Bravo Company's maintenance activity for classification. Another example was the CRSP providing training to aviation SSAs on how to build daisy chained 463L pallets used in the movement of helicopter blades. Aviation SSAs subsequently relied on the use of the CRSP's 30K forklift capability to move the daisy-chained pallets.

## Retrograde Structure for Sustainment (Class II, IIIP, IV, and IX)

The Iraq and Afghanistan theaters evolved significantly after the beginning of both contingencies. Theater maturity and the tactical situation both played instrumental roles in shifting the responsibility of SSAs from brigade to area support. The theater structure provides area support through a three-tiered system based around well-defined supply points. The three-tiered system can be broadly thought of as having three types of SSAs: theater SSA, tactical SSAs, and regional retention SSAs.

### *Theater SSA*

Theater-level SSAs fall under the theater sustainment commands (TSCs) as central logistics nodes for theater opening, in-theater distribution, and sustainment operations conducted in support of the Army. On order, they can also support joint, interagency, and multinational forces. In addition, they can function as theater-level retention and redistribution points.<sup>10</sup> Accordingly, a parameter in the CTASC is normally set to check stock availability for most National Stock

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<sup>9</sup> ADRP 4-0, 2011, para. 3-131:

An approved military customs inspection program must be in place prior to redeployment to pre-clear not only redeployment materiel but also the shipment of battle damaged equipment out of theater. The Theater Army ASCC is responsible for establishing the customs inspection program to perform U.S. customs pre-clearance and United States Department of Agriculture inspection and wash down on all materiel retrograded to the United States in accordance with DOD 4500.9-R.

<sup>10</sup> The theater SSA and CRSP are doctrinal function performed by the Sustainment brigade and described in FM 4-93.2, 2009, para. 4-136.

Numbers (NSNs) at theater SSAs before requisitions are passed to the national level. The TSC also oversees RSYs. These are central collection and consolidation points for Class II, III(P), IV, and IX materiel from any SSA in theater. The 1st TSC has three principal theater SSAs that provide support to the OIF areas of operation (AOs) within the U.S. Central Command (CENTCOM) area of responsibility (AOR).<sup>11</sup> Located at Camp Arifjan in Kuwait, they can be identified in a multitude of sources such as DAASINQ by their routing identifier codes and are dedicated to serviceable Class IX (W7A), serviceable aviation (W2Q), and unserviceable (W2N) parts.

### *Tactical SSA*

Tactical SSAs provide direct supply support to supported units. While many are organic to brigade combat team (BCTs) and support brigades, these tactical SSAs served and continue to serve area support missions in Iraq and Afghanistan. For the same reason, Army units that are rotating out of theater leave their equipment for their replacement units. Similarly, SSAs in theater did not redeploy with units at the end of their tours in OIF/OEF; rather, SSA stocks and even logistics automation remained in place, with the incoming unit falling in on an established SSA.

Although SARSS is capable of lateral redistribution among SSAs, most tactical SSAs in OIF and OEF were coded in CTASC, such that CTASC did not search other tactical SSAs and draw on their stocks for stock replenishment or to fill customer demands. Instead, CTASC searched the regional retention SSAs, followed by the theater SSA. If stock was unavailable at either of these sources, the requisition was passed to the wholesale source of supply outside the theater.

### *Regional Retention SSAs*

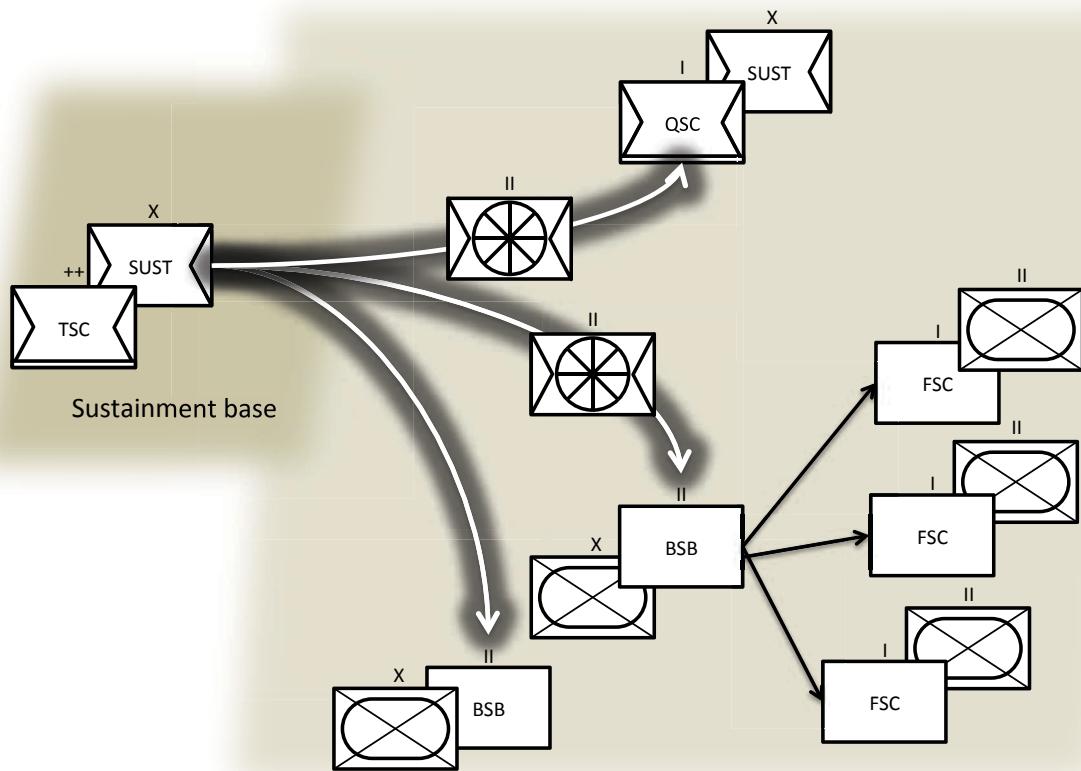
Unlike Class V, forward supply and retrograde for Classes II, III(P), IV, and IX do not follow the same routes. Forward supply generally flows to tactical SSAs straight from the source of supply, as illustrated in Figure 3.1.

However, there is no direct retrograde flow from a tactical SSA back to the continental United States (CONUS). Instead, retrograde flows either directly to the theater-level SSA or to modified tactical SSAs known as *regional retention SSAs*. Preventing each SSA from shipping directly out of the theater promotes retention for possible reuse in theater and allows consolidation of retrograde shipments. Reverse flow is depicted in Figure 3.2.

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<sup>11</sup>In practice, three SSAs principally supported OIF. While some OEF retrograde passed them, a significant amount bypassed the theater SSA.

**Figure 3.1. Class IX Forward Supply Diagram**

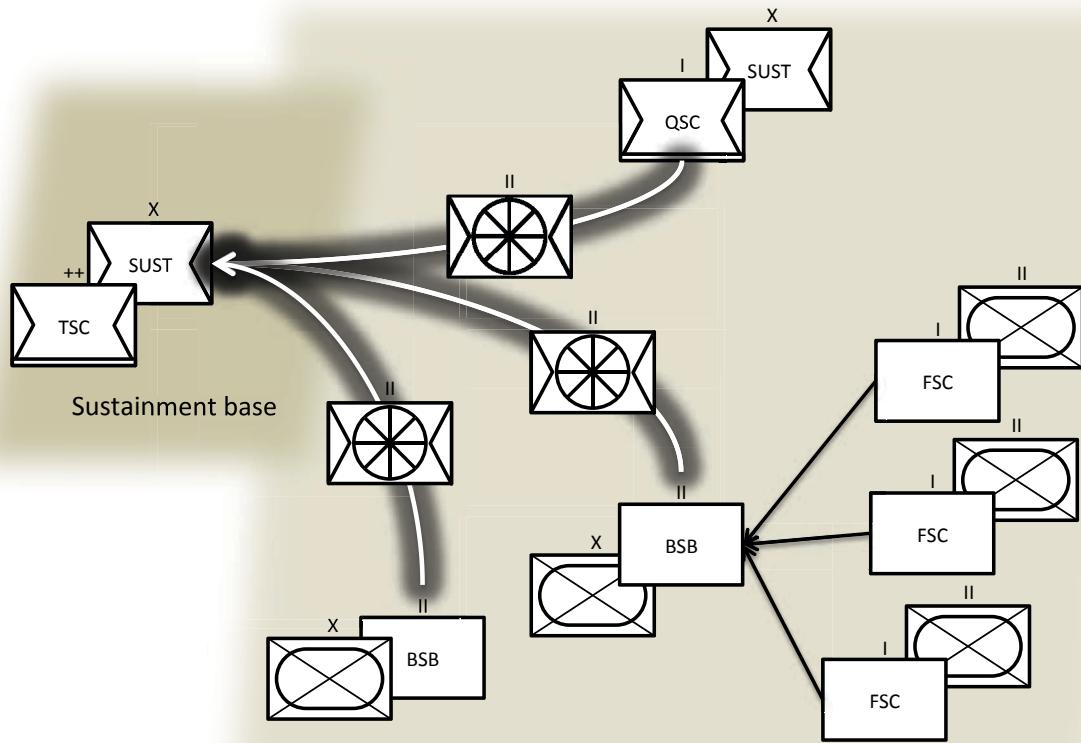


SOURCE: Adapted from FM 4-93.2 (2009), Fig. 4-18.

NOTES: BSB = brigade support battalion; FSC = forward support company; QSC = quartermaster support company; SUST = sustainment brigade; TSC = theater sustainment command.

Regional retention SSAs are not found in doctrine, as with the field depots or collection, classification, and salvage companies of Vietnam, were established to fill a wartime need. In both Iraq and Afghanistan, the need emerged to consolidate retrograde shipments before they were sent out of country. Thus, SSAs in each region were directed to ship serviceable retrograde to the designated regional retention SSA for consolidation for shipment either to a theater SSA or the designated ship-to location. The regional retention SSAs also had the mission of retaining high-demand items and redistributing them to tactical SSAs in their region. Supply system parameters were set to check availability at the local regional retention SSAs before availability was checked at the theater SSAs. In some cases, regional retention SSAs also provided direct supply support to local customers. By consolidating shipments and retaining high-demand items, regional retention SSAs saved the Army cost by increasing shipping efficiency and elimination of retrograde for high-demand items that would likely have needed to be reshipped back into theater.

**Figure 3.2. Class IX Flow Diagram**



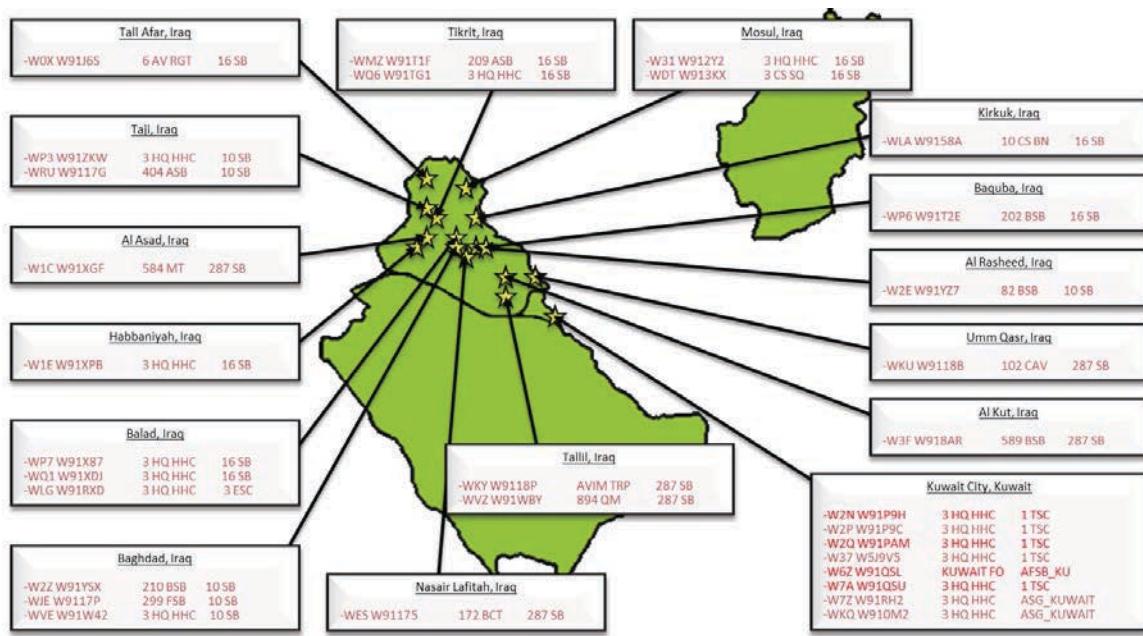
SOURCE: Adapted from FM 4-93.2 (2009), Fig. 4-18.

As shown in Figure 3.3 (from 2010), at the height of OIF/OND, the Army had a multitude of SSAs spread throughout the Iraq area of operation. The two regional retention SSAs, WP7 and WLG, were set up at Balad Air Base (Logistics Support Area [LSA] Anaconda), just outside the central town of Balad, to serve northern and centrally located SSAs.

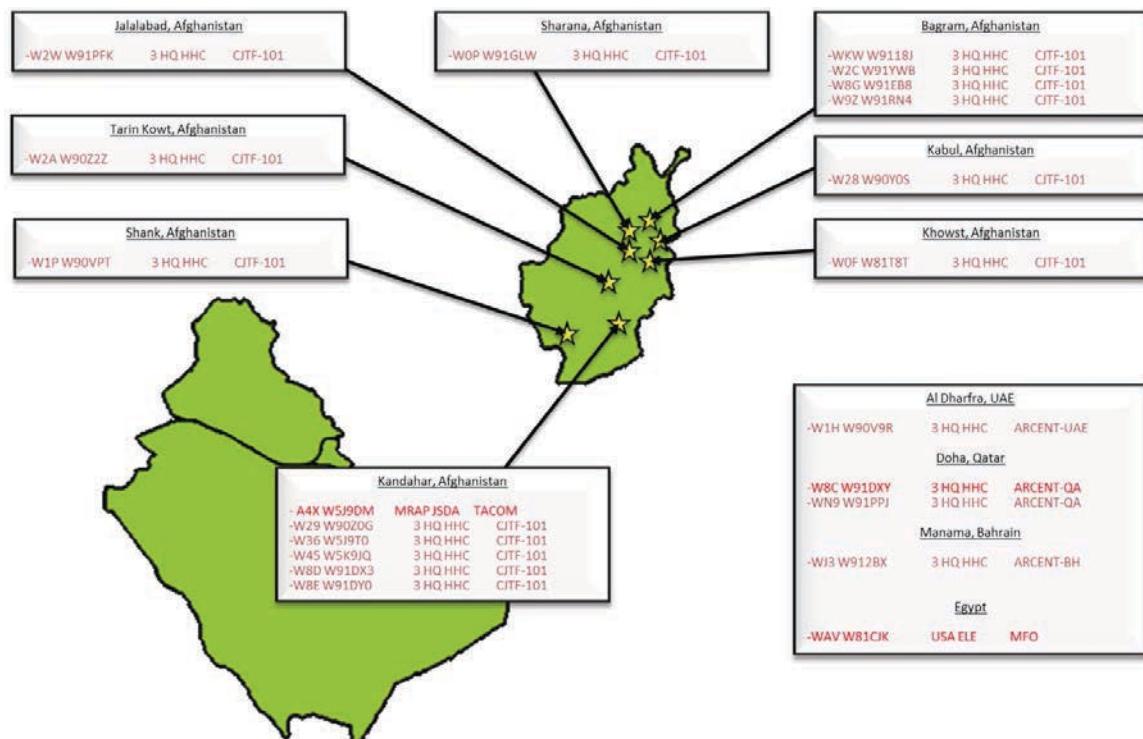
In Afghanistan, regional retention SSAs were split between the north and the south (Figure 3.4). Unlike Iraq, which had a ground line of communication to Kuwait, Afghanistan relies heavily on ALOC for retrograde. Thus, the best structure is to have regional retention SSAs located both in the north and south. The southern city of Kandahar has three regional retention SSAs: W6U (sorting yard), W8D, and A4X (Mine Resistant Ambush Protected Vehicle Class IX warehouse). The northern city of Bagram has one: W8G.

Other countries with regional retention SSAs are Kuwait (W6Z) and Qatar (W8C). It should be noted that, while many of the regional retention SSAs started with a direct support mission, not all the regional SSAs retained it. Indeed, over the course of the conflict, some regional SSAs have converted to regional retention points and no longer support unit-level customers.

**Figure 3.3. Iraq Supply Support Activities in 2010**



**Figure 3.4. Afghanistan Supply Support Activities in 2010**



### ***SSA Staffing***

Staffing of SSAs in the theater ranged from approximately 25 to over 50 personnel each. Depending on the type of SSA and location, staffs were either uniformed military personnel or contractors. Generally speaking, tactical SSAs were staffed with 25 to 30 uniformed military personnel, sometimes augmented by approximately five contractors.

The regional retention SSAs and the RSYs, on the other hand, were significantly larger and were staffed primarily by contractors. Approximate staffing reported for the RSY at Kandahar was the accountable officer (noncommissioned officer [NCO] in charge or civil service civilian), ten expatriates (U.S. civilians), and 40 third-country nationals. At times, there was an NCO in charge; however, there was no supply systems technician (920B).

### ***Retrograde Sort Yards***

For sustainment materiel (Classes II, IIIP, IV, IX), transportation companies will then typically move that materiel to an RSY,<sup>12</sup> which performs many of the functions of an SSA but is typically staffed by contractors. As of this writing (fall 2013), there were three RSYs in Afghanistan: W6U/W56JKU in Kandahar, W6V/W8002V in Bagram, and W75/W56N6 in Mazar-e Sharif.

### **Retrograde Structure for Ammunition (Class V)**

The ammunition supply system has two layers: The national system handles procurement and wholesale storage, and the tactical system serves customers.

#### ***National***

The national ammunition system has 14 installations,<sup>13</sup> including four depots, eight ammunition plants, and two munitions centers (Department of the Army [DA], 2012). Together, these 14 facilities

- provide depot-level maintenance, repair, and modernization of weapon systems and component parts
- manufacture, renovate, and demilitarize materiel
- produce munitions and large-caliber weapons
- perform a full range of ammunition maintenance services for DoD and U.S. allies
- perform ammunition receipt, storage, and issue functions.

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<sup>12</sup> The RSY is a nondoctrinal activity established in Iraq and Afghanistan to provide a centralized location to process retrograde.

<sup>13</sup> U.S. Army Materiel Command, Ammo Plants BRAC End State, briefing, October 8, 2014. See U.S. Army, Joint Munitions Command, undated, for a list of ammunition installations.

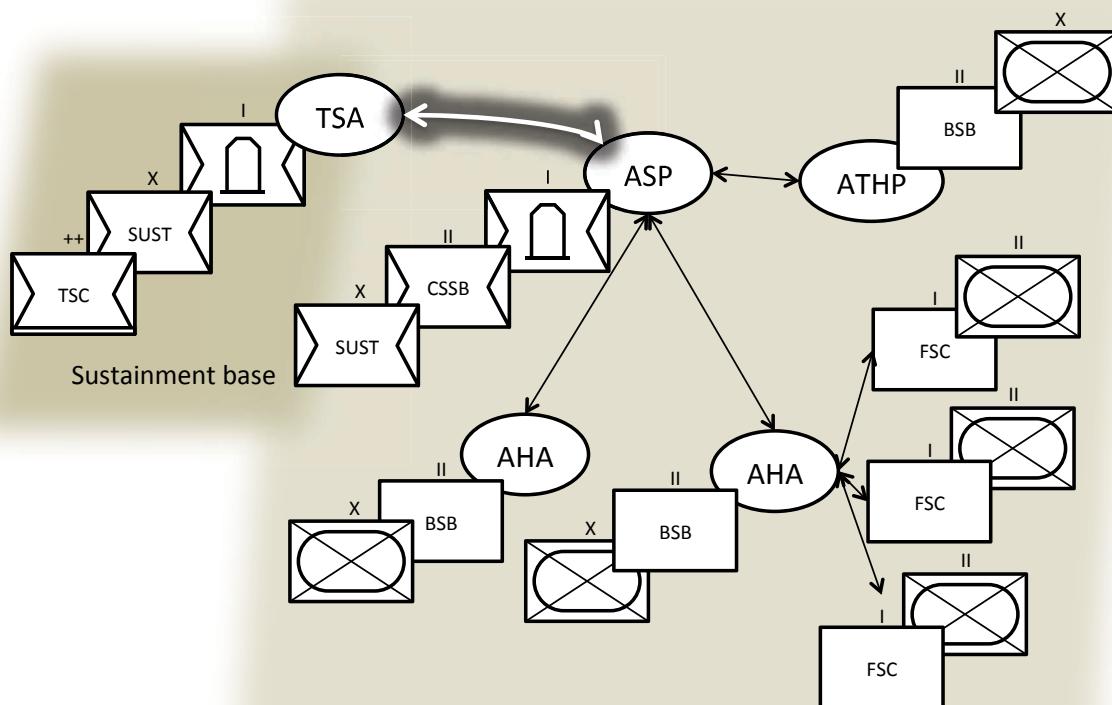
## Tactical

As Figure 3.5 shows, the tactical supply system contains three layers: the theater storage area (TSA), ammunition supply points (ASPs), and ammunition transfer holding points (ATHPs). Ammunition follows the same route, either traveling forward from the TSA to the ASP to the ATHP or in retrograde.

### Theater Storage Area

Outside the continental United States (OCONUS), shipments arrive at the ammunition point of debarkation and are then sent to the TSA. The TSA serves as the initial hub for all services, and its manager must be familiar with the TSA's joint operations responsibility. Usually the largest ammunition supply activity (ASA) in the theater of operations and located within the theater's rear AO, the TSA receives, stores, and ships containerized and break-bulk munitions. It issues, inspects, configures, manages, and maintains theater reserve munitions and related materiel packing. The TSA is normally a permanent or semipermanent storage facility and is generally operated by a modular ammunition company (FM 4-30.1 [FM 9-6], 2003, para. 2-5).

**Figure 3.5. Ammunition Supply Flow Diagram**



SOURCE: Adapted from FM 4-93.2 (2009), Fig. 4-13.

NOTES: ATHP = ammunition transfer holding area; ASP = ammunition holding area; CSSB = corps sustainment support battalion; TSA = theater storage area.

### Ammunition Supply Point

According to the most recent doctrine, which was published in 2003, the ASP is a field site that prepares and ships munitions in mission-configurable loads or single DoD Identification Code (DODIC) loads and provides munitions support to corps and nondivisional units. The ASP is operated by one or more modular ammunition companies. Doctrinally, ASPs maintain a one-to three-day supply to meet a routine surge and emergency requirements, but stock can vary significantly based on mission, enemy, terrain and weather, troops and support available, time available, and civil considerations factors (FM 4-30.1, 2003, para. 2-10). This was the case in Iraq and Afghanistan, where ASPs were large and served many TSA-like functions.

### Ammunition Transfer Holding Point

Because they are temporary, ATHPs are not doctrinally configured to perform static ammunition receipt, storage, and issue functions and are therefore not technically ASAs.<sup>14</sup> However, doctrinally, an ATHP may have a fixed location and may be organized to fulfill ammunition requirements for all divisional, nondivisional, and corps elements operating in an area.<sup>15</sup> This is much closer to what we observed in OEF and OIF. In theater, ATHPs and Standard Army Ammunition System Modernization (SAAS-MOD) had their own DoD Activity Address Code (DODAAC) which allowed them to perform some of an ASA's functions. While each BCT is authorized an ATHP, the locations of the ATHPs in Iraq and Afghanistan were tied to forward operating bases (FOBs) and served area support missions.

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<sup>14</sup> FM 4-30.1, 2003, para. 2-4:

Three types of ASAs are in the theater: TSAs, CSAs, and ASPs. An ATHP is not considered an ASA because of its temporary nature. The ASA mission is to receive, store, issue, and maintain the theater conventional ammunition stocks. Also, ASAs can configure ammunition into CLs. Once configured, CLs are shipped forward to ATHPs for issue to combat units.

<sup>15</sup> FM 4-30.1, 2003, para. 2-12: "The modular ammunition company operates one ATHP in the division rear, usually near the division support area (DSA). The ATHP is organized by combining the rear ATHP sections of the three MLPs within the ammunition company."

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## 4. Data and Standard Army Management Information Systems

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The Standard Army Management Information Systems (STAMIS) constitute the information backbone of the supply system and are key sources of data for logistics command and control. Data to support the development of retrograde planning factors reside in Army STAMIS. STAMIS have grown to reflect the division of responsibilities within the Army's supply system and are accordingly broken down by class, as required for development of planning factors. Table 4.1 indicates the types of data RAND used to develop retrograde planning factors and describes the scope of the extracts for each type.

This section discusses the two STAMIS used to develop retrograde planning factors: SARSS, which is used for Class II, IIIP, IV, and IX retrograde planning factors and the Worldwide Ammunition Reporting System (WARS) which is used for Class V retrograde planning factors. Other subordinate or related STAMIS are also discussed briefly.

### Standard Army Retail Supply System

Sustainment materiel is managed through a network of systems that depend on the level of the supply chain. SARSS consists of three hierarchically structured subsystems: SARSS-1, SARSS-2AC, and SARSS-2B. Acting much like a hub-and-spoke network, SARSS-2AC provides centralized management functions to sustainment planners, while SARSS-1 provides the SSAs an automated capability to pass requisitions and to receive, store, and issue supplies. SARSS-2B maintains historical records of all transactions processed through SARSS.

**Table 4.1. STAMIS by Class of Supply**

Class	System	Project Use
II	CTASC/SARSS	Complete information going back to 2002
III(P)	SAMS	
IV	PBUSE	
IX		
V	WARS SAAS-MOD LMP PBUSE Total Ammunition Management System	Received 1st TSC data from SAAS Acquired complete WARS data set going back three years
II(D)	PBUSE	No visibility into PBUSE-PBUSE transfers (a lot of Class VII transfers)
VII		Lack on-hand records
VIII	Theater Enterprise-Wide Logistical System	Not deemed necessary as retrograde is negligible

SARSS-2AC and SARSS-2B are both on the same platform and share a common database and will hereafter be referred to jointly as *CTASC*.

At each SSA, SARSS-1 provides an automated capability to requisition, receive, store, and issue supplies. Importantly, SARSS-1 also has interfaces to Property Book Unit Supply Enhanced (PBUSE),<sup>16</sup> used by unit supply activities and property book officers, and Standard Army Maintenance System (SAMS),<sup>17</sup> used by tactical- and installation-level maintenance activities.

The CTASC is the heart of the Army's SARSS-based retail supply system, which the TSC uses to manage stock and custodial availability levels, maintain support relationships, and establish operating parameters. CTASC has the capability to document and maintain support relationships (which units are supported by which SSAs) by class of supply and custodial relationships (which SSAs are able to draw on stocks from other SSAs). These support and custodial relationships substantially dictate the overall theater supply structure and codify forward, reverse, and lateral supply lines.

Army supply managers are able to mine CTASC data through the Integrated Logistics Analysis Program (ILAP) at the U.S. Army's Logistics Support Activity (LOGSA). While historic data are available only for a specific duration, usually three years, the methodology outlined here provides a series of intermediate data sets that can be run semiregularly during a conflict to create the data necessary for later analysis. These data sets include complete information down to document numbers.

Many transaction types contributed to the development of retrograde planning factors. However, this section describes only the key transaction in each of the following categories: issues, receipts, and inventory. The factor label from Figure 4.2 is shown in parentheses following each label description to show which DICs are utilized to calculate the factor shown in the process flow.

#### Issues (Materiel Release Orders)

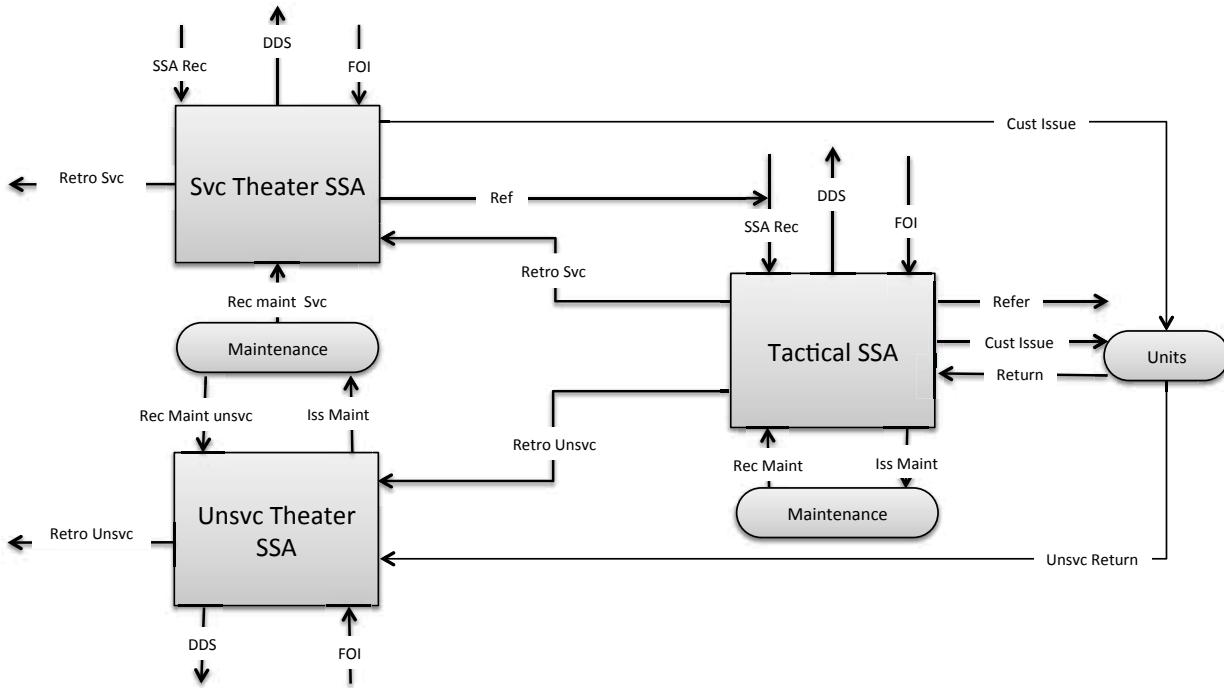
Document identification codes (DICs) starting with "A5" indicate materiel release orders (Figure 4.2). For retrograde, six different types of issues are of interest:

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<sup>16</sup> PBUSE is an automated property accountability system that provides online management information and automated reporting procedures for the property book officer. It is designed to assist commanders at all echelons in identifying, acquiring, accounting, controlling, storing, and properly disposing of materiel authorized to conduct the unit mission. PBUSE provides users the ability to process transactions for materiel supply Classes I, II, limited III (P), IV, VII, and limited IX (FM 4-93.2, 2009, para. 3-18).

<sup>17</sup> SAMS is an automated maintenance management system used by the sustainment brigade, CSSBs, and BSB. The system collects and stores equipment performance and maintenance operations data and automates work order registration and document registers, inventory control and reorder of shop and bench stock, and work order parts and requisitioning (FM 4-93.2, 2009, para. 3-19).

**Figure 4.2. Forward and Reverse Flow of Materiel**



NOTES: Cust Issue = customer issue; DDS = disposal release order; FOI = found on installation; received without documentation; Ref = materiel moved forward to another SSA; Iss MAINT = materiel sent to maintenance; Rec Maint = materiel received from maintenance; Retro = movement of materiel from a lower- to a higher-level SSA; Return = customer returns; Svc = serviceable; Unsvc = unserviceable; SSA Rec = receipt from a higher-level SSA or higher level of supply.

- Customer issue (Cust Issue)—A DIC A5A/A51 with manager materiel release order code (MGR\_CD\_MRO) “I” is an issue from an SSA to a supported customer. Generally speaking, this will occur only at an SSA with a direct support mission.
- Referrals (Refer)—A DIC A5A/A51 with MGR\_CD\_MRO “A” is an issue from one SSA to another SSA, such as when a regional retention and/or theater SSA issues retained stock to a tactical SSA.
- Retrograde (Retro)—A DIC A5A/A51 with MGR\_CD\_MRO “E” indicates inventory shifted from a lower-level SSA to a higher-level SSA.
- DDS (DDS)—A DIC A5J is an issue to DDS for reutilization or disposal.
- Issues to maintenance (Iss Maint)—DIC XML is a transfer of stock to maintenance for inspection, testing, or repair.

### Receipts

DICs beginning with “D6” indicate receipts. For retrograde, six different types of receipts are of particular interest:

- SSA receipt (SSA Rec)—A DIC D6S acknowledges receipt of materiel from a higher-level SSA. These can be thought of as indicating forward distribution.

- Found on Installation (FOI)—A DIC D6A with a receiving SSA DODAAC in record positions 30–35 is a receipt for an item that is found on site without documentation which can happen in both the forward and reverse pipelines.
- Return (Return)—A DIC D6A represents the return of materiel from a customer to the supporting SSA.
- Receipt from maintenance (Rec maint)—A DIC D6M indicates that an SSA has received repaired and tested items being returned from a commercial or government repair facility.

### Inventories (On-Hand and ASL)

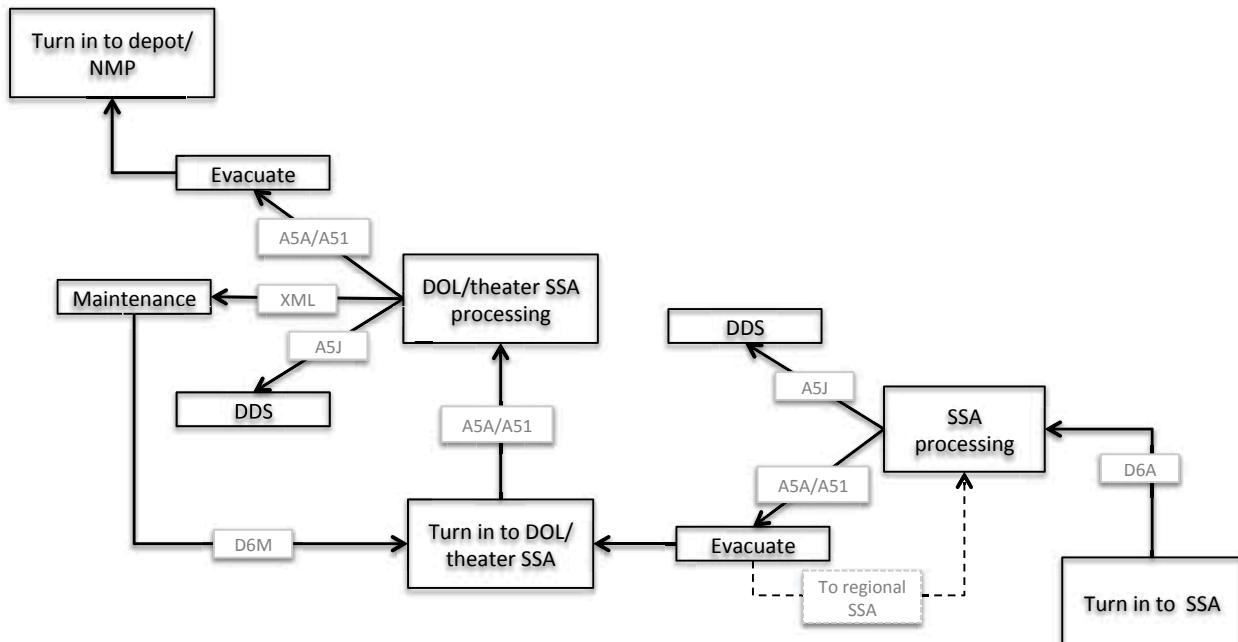
Each SSA can have an ASL that includes the quantities of items that particular SSA may have on hand or on order to meet customer demand. Items not on that list are considered nonstockage list (NSL). While not directly related, both changes to the ASL and shutdown of SSAs can also result in retrograde. This is particularly important during drawdown operations, when customers and even whole SSAs are leaving the AO.

### Retrograde Process

Figure 4.3 illustrates where the documents described above would be used in the retrograde process.

Additional information on SARSS transactions can be found in Appendix A.

**Figure 4.3. SARSS Retrograde Transactions**



NOTES: A51 = materiel release order for overseas shipment with NSN; A5A = materiel release order for domestic shipment with NSN; A5J = disposal release order for shipment to DDS; D6A = materiel receipt from supported customer; D6M = materiel receipt, return from testing or repair; XML = maintenance work order.

## Worldwide Ammunition Reporting System (Class V)

For reporting and analysis, WARS integrates the data from several logistics information systems, including the Logistics Modernization Program (LMP), SAAS-MOD, and PBUSE.<sup>18</sup> For most component systems, WARS stores three years of data. The data relevant to this particular analysis is that produced by the 1st TSC's SAAS-MOD instance and obtained from the WARS Program Manager at Joint Munitions Command. Similar to ILAP, WARS data are archived only for a specified length of time, ranging from six months to three years. Thus, it is necessary to receive a regular feed of the data and/or run the ammunition code provided in this report, which produces a summary file documenting all relevant transactions down to the document number.

### *LMP (National Class V)*

Once munitions are produced and tested (either in the organic industrial base, or by contract outside the organic industrial base), they are receipted into one of the CONUS ammunition depots and are accounted for with a receipt transaction in the Army Materiel Command's wholesale enterprise resource planning system, called *LMP*. From the depot, stocks are sent to the tactical level (ASP and below) and are tracked within SAAS-MOD.

### *SAAS-MOD (Tactical Class V)*

SAAS-MOD is the approved STAMIS for all Class V tactical ammunition inventory control and management. It automates and integrates tactical ammunition receiving, storing, and issuing operations among users, storage sites, and theater managers. SAAS-MOD consists of four suites of software, one for each of the following activities: ASP, ATHP, the Materiel Management Center, and the Division Ammunition Office. Functions include management of basic load, war reserve, and operational stocks (FM 4-93.2, 2009, para. 3-25). For example, each ASP uses SAAS-ASP to record receipt of ammunition.

### *SAAS-MOD Transactions*

Forty-one SAAS-MOD transaction codes contributed to the development of Class V retrograde metrics. These 41 transaction codes were grouped into 11 transaction types (see Appendix B). Transactions related to retrograde or found to be relevant were further grouped into issues and receipts:

- Issues: depot shipment, shipment (Retro), customer issue, destruction or DDS, loss, and issue maintenance or test
- Receipts: receipt (forward), turn in, FOI, and return maintenance or test.

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<sup>18</sup> PBUSE includes 50 caliber and above stocks located below the ASA level.

Not all these transactions were explicitly related to retrograde or were found to be relevant. Figure 4.4 depicts the key retrograde transaction types.

Because shipments are not coded with additional codes detailing the type of shipment, they were further categorized according to shipment issuer and recipient, condition code of the materiel, and type of transaction. These new categories matched those for CTASC and included forward, referral, and retrograde.

### *Property Book Unit Supply Enhanced Class V*

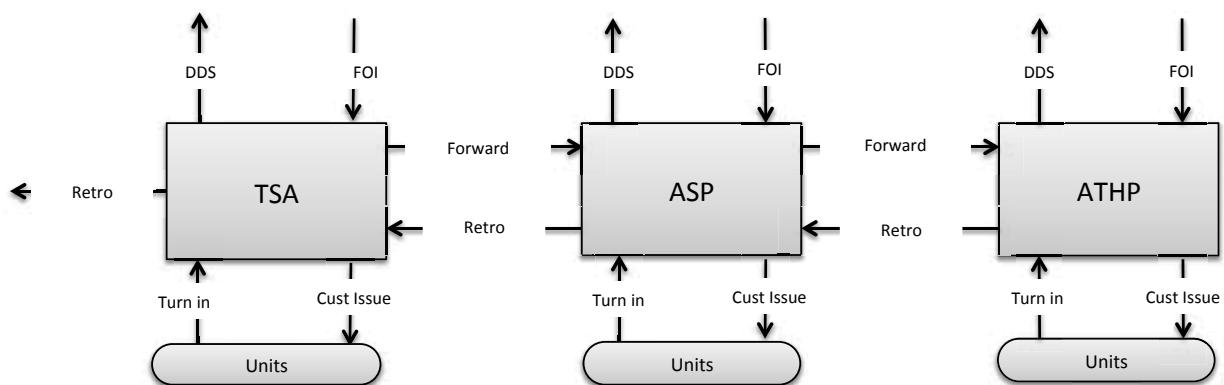
Ammunition transferred to the unit level for operational and combat loads is accounted for in PBUSE.

### **Property Book Unit Supply Enhanced (Class VII)**

It is important to note that, while the project made a high-level approximation of Class VII retrograde, the data did not allow a formal analysis. Class VII assets are accounted for in PBUSE, which does not keep the history of retrograde activity that SARSS does.<sup>19</sup> With the fielding of Global Combat Support System–Army (GCSS-Army), the Army may be able to capture Class VII retrograde transactions during future operations.

The only high-level approximation for Class VII retrograde is to track equipment movement via transportation data. This was done through the Global Air Transportation System (GATES)

**Figure 4.4. Key Ammunition Retrograde Transactions**



NOTES: Forward = ammunition movement to a lower-level storage activity; Retro = ammunition movement to a higher-level activity; Turn in = ammunition returned from a using unit to storage.

<sup>19</sup> By doctrine, Class VII is to be retrograded through a unit's supporting SSA. However, because of the scale of the Class IIV mission, RPAT yards and mobile RPAT teams were formed to handle Class VII retrograde, causing Class IIV retrograde to be excluded from SARSS.

for air movement and Transportation Coordinators' Automated Information for Movement System II (TC-AIMS II) via in-transit visibility data for surface movement.

*Global Air Transportation System*

GATES supports air mobility operations by managing global processing, tracking, billing, forecasting, report generation, and message routing and delivery for air passenger and cargo data at 19 aerial ports and 139 active remote and deployed GATES sites worldwide.

*Transportation Coordinators' Automated Information for Movement System II*

TC-AIMS II provides an enterprise-level deployment planning and execution tool in support of worldwide military operations that facilitates movement, management, and control of personnel, equipment, and supplies from home station to a theater of operations and back and provides in-theater support for onward movement, sustainment planning requirements, and source in-transit visibility data.

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## 5. Development of Methodology

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### Determining Appropriate Unit of Measurement for Retrograde Planning Factors

Historically, retrograde planning factors have been expressed in units of gallons per person per day, pounds per person per day, gallons per SRC per day, or pounds per SRC per day. The first step in development of the methodology was to determine whether these were appropriate measurements by doctrine.

FM 4-93.2 (2009) notes that supply companies have certain designated capabilities, generally specified in terms of weight (in pounds) per day. For example, a quartermaster supply company (QSC), as a consolidated SSA, can “provide for the receipt, storage, and issue of approximately 93.6 short tons (STONS) of Class I per day and 207.8 ST of Classes II, III (P), IV, VII, and IX stocks per day” (FM 4-93.2, 2009, para. 4-36).

Transportation company capability is similarly specified in doctrine in terms of pounds per day. For example,

a Medium Truck Company can, on a 24-hour basis, provide up to 52 trucks for mission operations and has a one-time lift capability as follows: Breakbulk General Cargo (395 STONS), Breakbulk Ammunition (709 STONS), Pallets (1060), 463L Pallets (212), Twenty foot Containers (TEU) (106), and Forty foot Containers (FEU) (53).

For transportation companies, weight may be the appropriate measure for capability. However, for SSAs, the number of transactions plays a significantly more pronounced role because heavy National Item Identification Numbers (NIINs) may overstate workload and light NIINs may understate workload. Thus, the use of weight would assume a standard mix of NIINs. It should be noted that commanders frequently use an Army Materiel Systems Analysis Activity estimate of 350 pieces of materiel per container for planning purposes. This estimation approach tends to overstate volume.

Given the extensive use of weight in current force planning models and in doctrine, total retrograde weight produced in theater was an appropriate measure for determining force structure, with the caveat that a standard mix of NIINs must be assumed.

### Determination of Retrograde Weight

To determine retrograde weight, algorithms were developed that drew on data from the sources described in the preceding section, as well as several custom tables, including an SSA table (see Appendix C), worldwide ammunition supply site table (see Appendix D), and a transaction type table (see Appendix B). This subsection will provide an overview of the critical

steps contained in each algorithm. The first algorithm generates planning factors for Classes II, IV, and IX (CTASC data), and the second algorithm provides planning factors for Class V (WARS data).<sup>20</sup>

## CTASC

The first step in determining retrograde weight was to develop an SSA table that covered the years of the conflict. This SSA table was developed by taking historical CTASC monthly DoD Activity Address File (DODAAF) tables extending back to 2002. DODAAF records with type unit codes 1, 2, 3, 6, and 7 were kept, and each record was labeled with the correct location (Iraq, Afghanistan, or Kuwait) of the relevant SSAs, the “start” (the year the SSA became active in Southwest Asia), and “end” (the year the SSA discontinued operations in Southwest Asia). Appendix C provides the output of this process. Once this table was developed, SSAs were divided into three levels, according to the following rules:

- Theater: SSAs with a type unit code of 6 or 7
- Regional: SSAs with an RIC of WP7, WLG, W6U, W6Z, A4X, W8G, W8D, or W8C
- Tactical: all others.

The second step was to filter the Asset Balance File (ABF) from LOGSA, showing a monthly snapshot of the on-hand quantity, weight, and cube of each NIIN, to include only the stocks on hand at the relevant SSAs. The amount on hand was further labeled as either serviceable or unserviceable, with serviceable including all items with a condition code of A, B, C, or missing.

Next, the receipts, issues, and status tables were filtered to keep only the relevant transactions, as described in Section 4. These transactions were then filtered to remove any transactions that were obviously false because their size would have exceeded relevant authorities. These rules were developed by looking at actual transaction data (see Table 5.1 for the filters).

Tables were rolled up and combined at various levels, including the document number, DODAAC, and NIIN, for further analysis. Additionally, using the monthly ABF table, changes to on-hand amounts were calculated by subtracting the current on hand from the previous month’s on hand. This output was labeled as a new transaction type (ohdelta) and was combined with the existing tables.

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<sup>20</sup> CTASC data are available from the LOGSA’s Integrated Logistics Analysis Program, and WARS data are available from the WARS program manager.

**Table 5.1. CTASC Transaction Filters**

<b>Class</b>	<b>Unit Price</b>	<b>Quantity</b>	<b>Value (\$M)</b>
IX	>25,000 and >1,000 and or	>100 >1,000	>10
II	>10,000 and >1,000 and or	>100 >3,000	>4
III	>10,000 and ≥10,000 and or	>100 >10,000	>1
IV <sup>a</sup>	>10,000 and >5,000 and or or	>100 >1,000	>12 >0.5 <sup>b</sup>

<sup>a</sup> Except FSCs 5510 and 5675

<sup>b</sup> FSCs 5510 and 5675

## WARS

The development of the WARS data set followed a process very similar to that for the CTASC data set. First, a DODAAC table was developed using a list of DODAACs from Joint Munitions Command and using a list of DODAACs derived from the DODAAF table by filtering for relevant nomenclature. This list was then augmented by populating it with information from the DODAAF table and applying labels. Appendix D provides the output of this process.

There was no historical on-hand information for Class V, so the next step was to filter the WARS data set for relevant retrograde transactions, as described in Section 4. However, since there were no differentiators between shipment and receipt types in WARS, the origin and destination were used to identify the type of transaction. For example, a transaction from an ASP back to the TSA would be considered retrograde. Alternatively, a transaction from the TSA to the ASP would be considered a forward shipment.

Last, as with the CTASC data, this data set was rolled up at various levels for analysis.

## Analysis and Selection of Metric

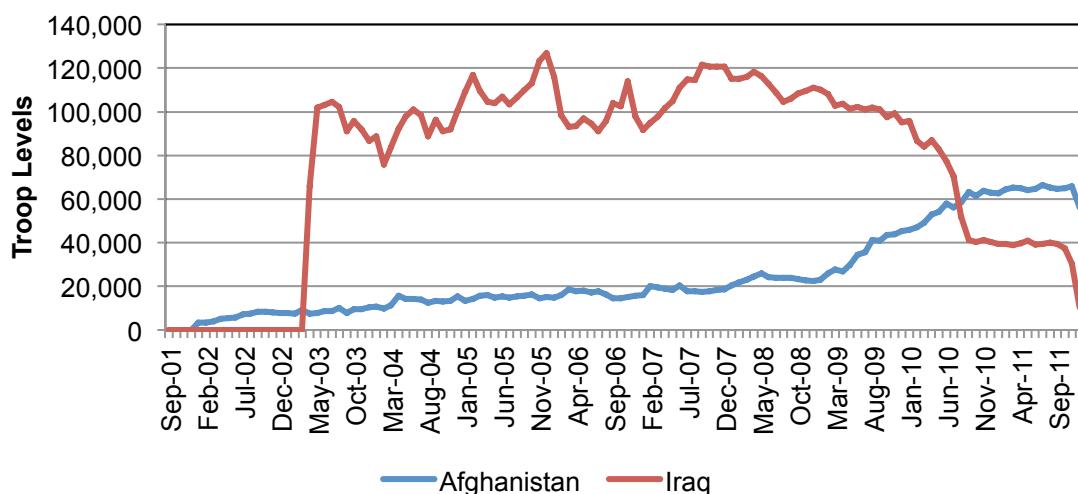
For the assessment of pounds per person per day, the Congressional Research Service provided troop levels in Iraq and Afghanistan (see Figure 5.1). Pre-October 2004 service-level figures were not available, so an estimate was made based on the service-level fraction of total troops present after October 2004.

Tactical retrograde totals for Iraq and Afghanistan across all classes were divided by the number of troops in the theater. However, this section will only cover the CTASC analysis because the Class V (WARS) analysis resulted in the same conclusion. The CTASC-specific analysis in Figure 5.2 shows that the median yearly retrograde (consisting of issues to maintenance, retrograde, and DDS) was 7.6 pounds per person per day. The total consisted of 0.8 lbs. of Class II, 0.3 lbs. of Class IIIP, 2.4 lbs. of Class IV, and 4.1 lbs. of Class IX.

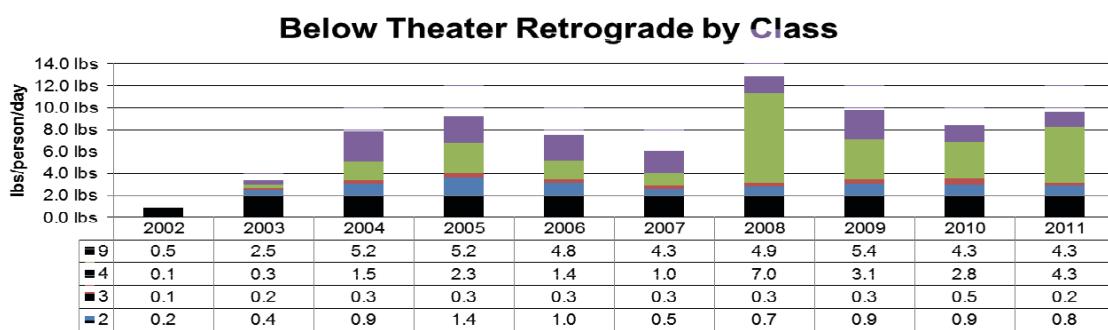
The data suggest several things. First, there was a dramatic increase in Class IV retrograde in 2008, with a lesser increase in following years. Second, retrograde did not follow a predictable pattern but rather (sans Class IV) followed a somewhat normal distribution (first increasing, then decreasing).

The 2008 Class IV spike occurred when a large amount of Class IV materiel was brought “on the books.” This occurred because, prior to 2008, Class IV at engineering yards was managed offline, in Excel spreadsheets. Beginning in 2008, Class IV materiel was brought into SARSS

**Figure 5.1. OEF and OIF Troop Levels**



**Figure 5.2. Below Theater Retrograde by Class**



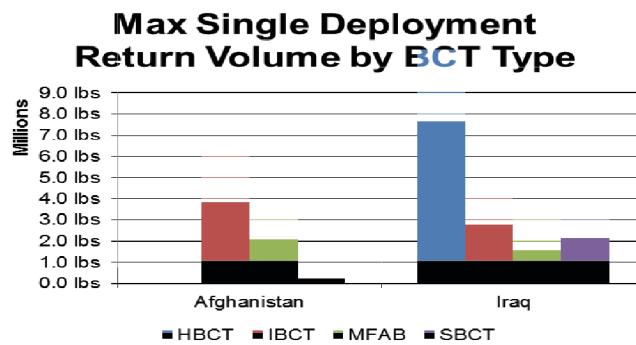
through FOI, resulting in the impression of a large amount of retrograde. In reality, this materiel was quickly redistributed through regional SSAs to fulfill demand elsewhere. This spike was specific to Afghanistan theater development and will likely not be repeated. It is, however, impossible to separate FOI that came in as part of this accounting change from regular FOI. Additionally, previous FOI had been underestimated because it was handled through the engineering yards. For these two reasons, the estimates that follow include all Class IV FOI.

The explanation for the uneven distribution of retrograde when adjusted for troop levels is not as intuitively obvious. At first glance, it appears that retrograde per person increased as the theater developed and then decreased as the theater closed out. This is counterintuitive to the economies of scale one might expect. As analysis of brigade deployments and customer issues reveals, the pounds per person per day metric masks two important trends (see Figure 5.3).

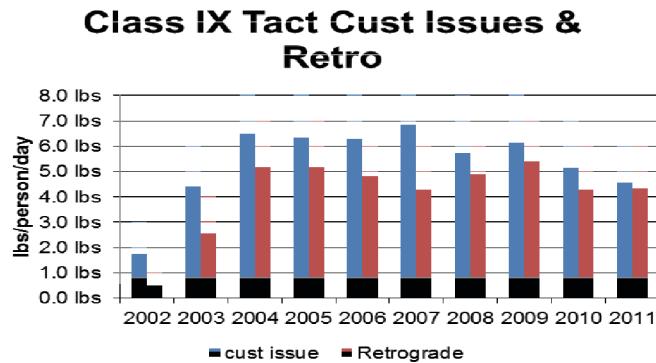
The first trend was revealed when selected deployments were used to judge retrograde of differing brigade types over an entire deployment. This shows that Iraq produced 40 percent more retrograde weight than Afghanistan in the selected deployments because of the different brigade types present. Additionally, because of the differing equipment densities and equipment types, similar brigades in the two theaters had different retrograde quantities. The first trend, then, is that different brigade types coupled with different equipment densities and equipment types will result in different retrograde weights.

The second trend is that comparing retrograde quantities for only Class IX to customer issues shows that customer issues (see Figure 5.4), which are highly sensitive to equipment types and equipment density, closely correlate with retrograde. This makes intuitive sense because unserviceable retrograde will be roughly at parity with reparable customer issues. Serviceable retrograde will be a function of forward distribution and returns, both of which are closely related to customer issues.

**Figure 5.3. Single Deployment Return Volume**



**Figure 5.4. Class IX Tactical Issues and Retrograde**



Generic pounds per person per day metrics that can be adjusted for the specific conflict could account for the differences between theaters, theater development, and unit types. However, a far simpler solution exists: Determine retrograde planning factors as a percentage of customer issues. This eliminates theater, theater development, and unit type variances and leverages existing demand models.

## Testing Robustness

The Class IX analysis showed that retrograde as a percentage of customer issues is the most promising metric for retrograde planning factors. Several demand models currently exist that can be used as inputs for forecasting. These combined with the percentages would produce weight figures that could be inputted into the FORGE model.

However, to fully validate the use of the percentage of customer issues as the metric, we first tested for robustness across classes and over time.

As Figure 5.5 shows, the percentages remain relatively stable over time, varying by less than ~15 percent except for anticipated exceptions related to unclear or loosely followed policy, as discussed in the following paragraph. It is important to note that, due to the unrelated shutdown of a tactical SSA in 2002 and the overall small footprint, percentages for that year were not included; the unrelated shutdown would have dominated any calculations. While the figure includes only four metrics for Class IX, the various categories of metrics shown are stable across time and classes.

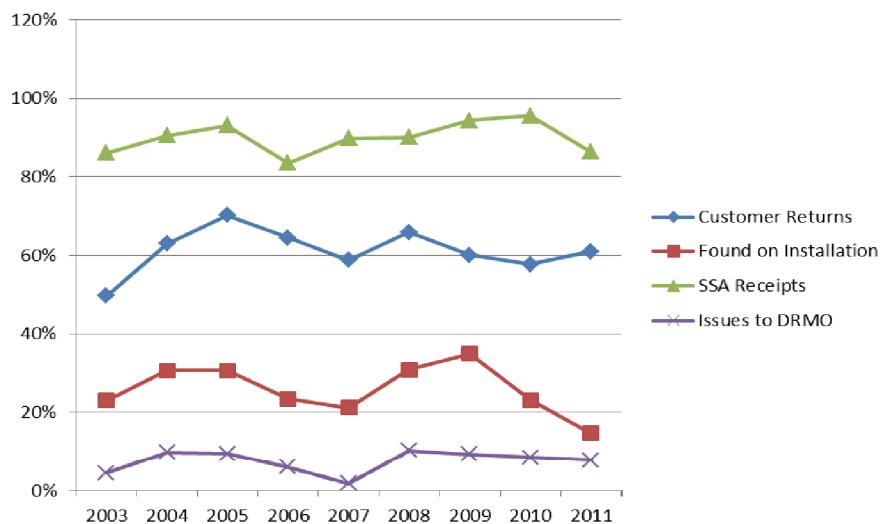
A few notable exceptions occurred early in the conflict that test the assumption of stable metrics. Evaluation of these exceptions revealed a predictable trend. Known policy changes and lapses in accountability led to brief spikes in underlying metrics, particularly in FOI. One such example is the brief receipt of vast quantities of materiel in theater SSAs as FOI. Rather than remove these exceptions, spikes were included because the materiel would have arrived in other forms (or at different times) and thus would have generated similar workloads.

Figure 5.6 illustrates theater and tactical SSA Class IX materiel flows. When deriving metrics associated with these flows, a key consideration was the denominator of each metric:

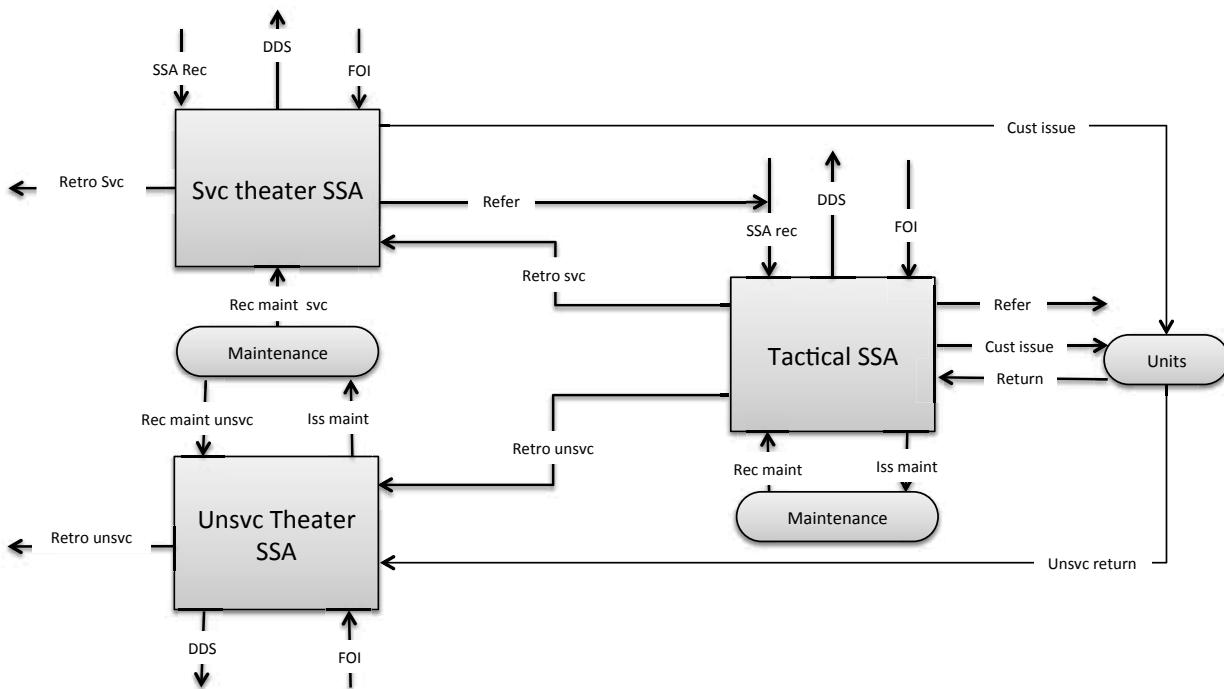
Theater SSA Factor = Metric / (Tactical SSA + Theater SSA customer issues)

Tactical SSA Factor = Metric / (Tactical SSA customer issues).

**Figure 5.5. Percentage of Customer Issues for Selected Class IX Transaction Types**



**Figure 5.6. Theater SSA Class IX Materiel Flows**



For tactical SSAs, the denominator was tactical SSA customer issues. For theater SSAs, the denominator was combined tactical SSA and theater SSA customer issues. Similar logic applies for the three echelons of ammunition support.

Figure 5.7 illustrates theater ammunition materiel flows. TSA metrics were calculated as a percentage of customer issues from the TSA, ASP, and ATHP, and ASP metrics were calculated as a percentage of customer issues from the ASP and ATHP:

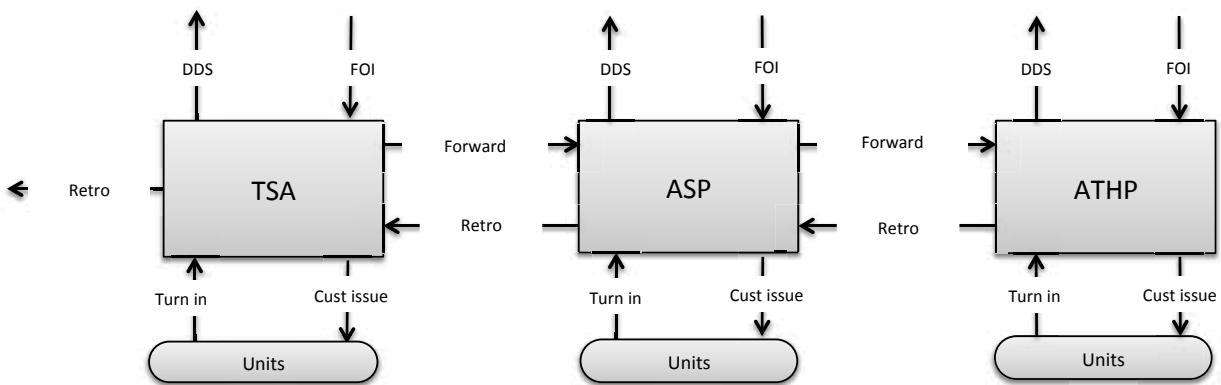
$$\text{TSA retrograde} = \text{retrograde} / (\text{TSA cust. issues} + \text{ASP cust. issues} + \text{ATHP cust. issues})$$

$$\text{ASP retrograde} = \text{retrograde} / (\text{ASP cust. issues} + \text{ATHP cust. issues})$$

There are, however, two important differences. Ammunition return rates were calculated at the individual echelons (ASP or ATHP) because returns were closely related to customer issues at each echelon, i.e., ASP returns equaled returns to the ASP divided by ASP customer issues, and ATHP returns equaled returns to the ATHP divided by ATHP customer issues. Similarly, forward flows into the ASPs were calculated as a percentage of customer issues at the ASPs and ATHPs, whereas forward flows out of the ASPs were calculated as a percentage of customer issues at the ATHPs only.

After examining all classes, one major exception to the stability of metrics stood out. Issues, receipts, and the repair success rate (serviceable receipts divided by total issues) for Class IX reparables in theater changed noticeably in 2006. This brings to light an important qualification to the metrics for Class IX. The reason for the change in 2006 was the establishment of an in-theater repair and return to stock program for repairable Class IX. The planners' decision about where to put sustainment maintenance support for repairable Class IX directly affects retrograde flow, increasing it if maintenance is located further to the rear or decreasing it if maintenance is located forward. Structural decisions, such as these, that cause a change to the underlying retrograde flows will, by necessity, result in a proportional change to retrograde planning factors in the amount of the retrograde diverted, eliminated, or added and must be taken into account

**Figure 5.7. Theater Ammunition Materiel Flows**



when factors are applied. For example, in 2006, when maintenance was established in Kuwait, issues to maintenance increased from 11 to 20 percent, and serviceable receipts from maintenance jumped correspondingly, from 1 to 11 percent.

## Selection of Phases

### *Notional Phases*

Per JP 3.0 (2011, Ch. V, Sec. B), a *phase* “is a definitive stage of an operation or campaign during which a large portion of the forces and capabilities are involved in similar or mutually supporting activities for a common purpose.” Each phase should represent a natural subdivision of the campaign or operation’s intermediate objectives and may vary (e.g., be compressed, expanded, or omitted entirely) according to the nature of the operation and the joint force commander’s decisions. Additionally, while phases are designed to be sequential, some activities from a phase may begin in a previous phase and continue into subsequent phases. Per JP 5.0 (2011), the notional phases are

- Phase 0: Shape
- Phase 1: Deter
- Phase 2: Seize initiative
- Phase 3: Dominate
- Phase 4: Stabilize
- Phase 5: Enable civil authority.

It should be noted, however, that these phases are notional and that an actual campaign may name and array phases differently or establish additional phases that fit their CONOPS. For the purposes of deriving OIF phases, the following time line and operational periods, based on observed troop counts and operations,<sup>21</sup> were used:

- 2001–February 2003: Buildup for war
- March 2003–May 2003: Combat operations (invasion)
- June 2003–December 2003: Combat operations (sustainment)
- January 2004–January 2007: Sustainment
- February 2007–June 2007: Surge
- July 2007–January 2008: Sustainment (Army—120,000 troops)
- February 2008–December 2011: Drawdown.

One of the tasks of this effort was to determine the best periods for developing retrograde planning factors. From early on, the following dates appeared to represent the best notional phases:

- Phase 2: 2003–2004

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<sup>21</sup> Time lines and operational periods may differ from G-3 dates. The next discussion will examine DA approved dates.

- Phase 3: 2005–2007
- Phase 4–5: 2008–2011.

Several factors led to this list. First, there were no apparent differences between phases at the tactical level. Thus, the dates were chosen according to their effect on the theater SSAs in Kuwait, which supported both contingencies. We did, however, compare numbers at the monthly level and between theaters to check for robustness. The factors do not change appreciably over time because they are a function of forward flows and because sustainment materiel was appropriately drawn down to prevent mass retrograde during withdrawal. This makes monthly figures, and splitting figures between OND and OEF, unnecessary.

Second, the former, more granular, time line, suggests why all of 2003 was included in Phase 2 and why Phase 4 was cut off at 2008. While the June 2009 date has been deemed the beginning of Phase 5, troop drawdown in Iraq began in January 2008. Troop levels, as reported to Congress and provided by the Congressional Research Service, dropped from 120,000 to 115,000 in January 2008 and had already declined to 102,000 by June 2009. Major troop withdrawals did not begin until January 2010, when troop figures decreased from 96,000 to 87,000 and then fell to 39,000 over the subsequent 12 months.

### *Department of the Army OIF/OND Phases*

While the DA does not have an approved phase time line for OEF for use in logistics planning factors, the DA approved the following phases for OIF/OND:

- Phase 1–3: March 2003–June 2003
- Phase 4: July 2003–May 2009
- Phase 5: June 2009–December 2011.

These compare with notional phases for retrograde planning developed during this effort but do not perfectly align because the phases developed recognized specific operational periods related to retrograde and because the theater SSA was simultaneously serving two AORs, each with different phasing. However, for completeness, retrograded planning factors were also provided for the DA-approved phases in Appendix G, and raw data by month were provided to CASCOM so that phases could be altered as is necessary.

### *Further Breakdown of Time Frames*

In this report, some planning factors are also divided into “before” and “after” establishment of in-theater repair and return to stock capability. Prior to 2006, most reparables were evacuated out of theater or stored until repair capability was established:

- before repair and return to stock established 2003–2005
- after repair and return to stock established maintenance 2006–2011.

The biggest change in retrograde planning factors was not between the phases but rather before and after the establishment of the in-theater repair and return to stock capability. While

some factors at the theater level changed between the phases, this mostly related to the changing role of the theater SSA; more materiel was being stocked in country, and less was being forward supplied from theater. The establishment of an in-theater repair and return to stock capability, on the other hand, provided a sharp discontinuity in the data and resulted in two distinct epochs. Thus, the data are categorized as belonging either to Phase 2–3 or Phase 4–5 and as coming from either before or after establishment of in-theater repair and return to stock.

### *Averaging Phases*

With the phases selected, possible ways to calculate an appropriate retrograde planning factor could be to (1) take a monthly average; (2) take an average across some other period; (3) take the entire phase together; or (4) use a median or some other percentile.

The selection of a calculation methodology depends largely on the desired outcome and is heavily preference based. However, a comparison of several of the different calculation techniques showed that the retrograde planning factors did not vary widely. With this in mind and with the goal of summarizing an entire phase, we chose to use the entire phase as one continuous period and not average over a shorter duration. Thus, adding all relevant materiel from across the phase and dividing the result and the total issues from that phase produced the planning factor. Should it be desired to model different phases, CASCOM has complete materiel volumes by country, class, year, month, and phase.

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## 6. Results

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Implementation of the methodology resulted in a new set of retrograde planning factors by class of supply. Additionally, several other previously defined factors, such as FOI, forward issue, and SSA receipts (also defined in Section 4 and Appendix A) were developed that relate to forward flow. Because these factors are instrumental for understanding the causes of retrograde, they are presented along with the retrograde planning factors throughout the following section. The results presented in this section are based on notional retrograde phases we developed. All results are documented further in the appendices, both for OIF/OND phases and by country.

### Class IX

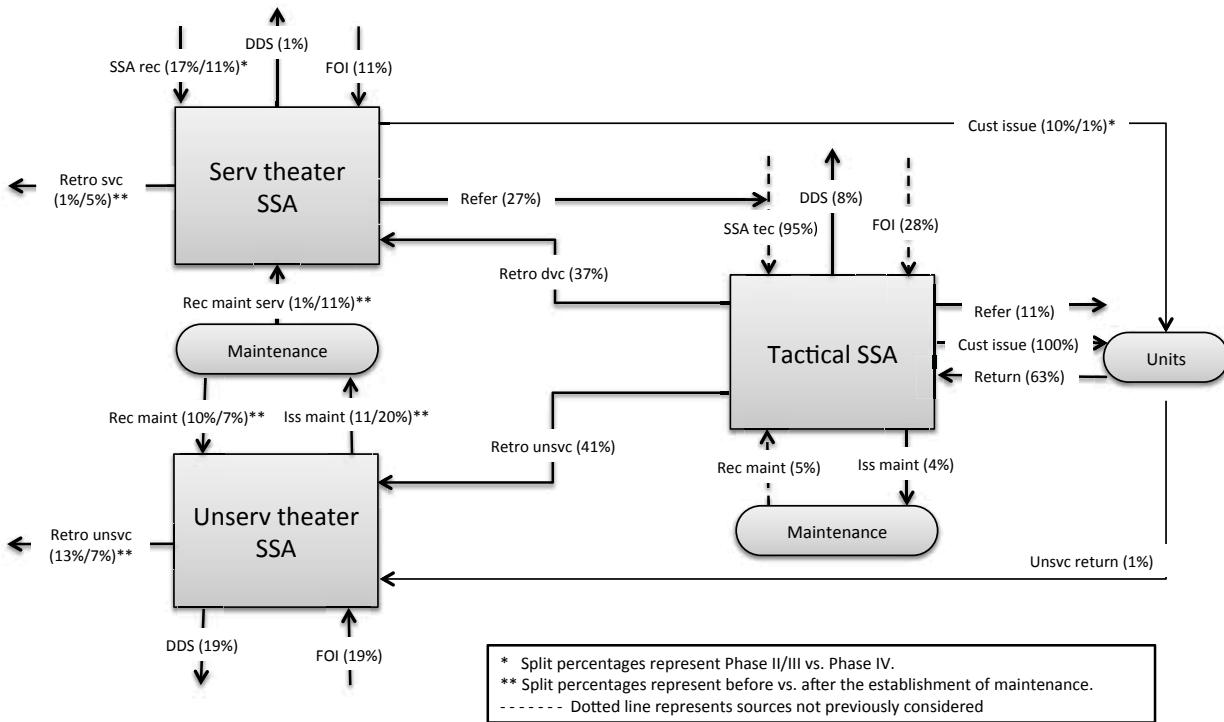
Class IX represents the greatest quantity of retrograde and will thus be presented first. Additionally, because of the large quantity of repairable materiel, Class IX provides an ideal place to start because the unserviceable loop is fully developed. Other classes generally do not have unserviceable flows or maintenance.

Within the U.S. Army Central Command (ARCENT) theater, most SSAs were tactical direct support SSAs, each supporting customers on an area basis, for both requisitions and retrograde. At the theater level (at Camp Arifjan for OIF, and Bagram and Kandahar for OEF), there were also general-support SSAs, for both serviceable and unserviceable materiel. As Figure 6.1 shows, while some SSAs perform the regional-retention SSA mission, for the sake of the metrics, these were combined with ordinary tactical SSAs as the flow of retrograde materiel did not substantially affect planning factors and tactical SSAs were tasked as regional retention SSAs.

As Figure 6.1 shows, the retrograde out of tactical SSAs to the theater SSA throughout both conflicts (Phases 2–5) averaged 37 percent serviceable and 41 percent unserviceable, both as a percentage of customer issues (pictured in Figure 6.1 as 100 percent). It should be noted that this is significantly higher than the 63 percent return rate, which consists of 15 percent serviceable and 48 percent unserviceable returns (see Appendix E). While, the unserviceable percentages approximately match, the serviceable percentages are not at parity. The reason for this is that, over time, SSAs receive more serviceable materiel than they issue to the customer. This stems from multiple sources including, but not limited to, supply chain inefficiencies, customer cancellations, and changing materiel requirements.

Comparison of the inflow and outflow of materiel at the SSA shows that the SSA receives the equivalent of 95 percent of customer issues weight in the form of serviceable SSA receipts from a higher-level organization, 26 percent in serviceable FOI, and 15 percent in serviceable customer returns (as seen in Appendix F and indicated above). In total, this equals 136 percent of customer issues. This emphasizes the reality that customer issues and customer returns are not

**Figure 6.1. Class IX Retrograde Map**



the only source of retrograde. This also largely explains the 37 percent serviceable retrograde rate. In analyzing sources of serviceable retrograde worldwide, returns, ASL reviews, SSA receipts, and FOI each contributed approximately equally to retrograde, albeit with returns contributing a slightly higher percentage than the other three.

SSA receipts, FOI, and receipts from maintenance are specifically called out by dotted arrows in Figure 6.1 to highlight the affect they exert on overall retrograde. These are three sources that had not previously been captured in retrograde estimates and which significantly drive serviceable retrograde. ASL reviews, not pictured, also contribute to retrograde.

While shipments of unserviceable materiel to maintenance and returns from maintenance are both pictured coming to and from the tactical SSAs, the scope of this activity was relatively limited and likely did not actually result in repair and return to stock. There were very few instances of repair and return to stock at the tactical SSA level.

As previously discussed, the theater-level SSA was split into two SSAs that handled serviceable and unserviceable ground materiel, respectively, with the unserviceable theater SSA (W2N) receiving all unserviceable ground retrograde from OIF (a third theater-level SSA handled aviation retrograde). While it might be tempting to attribute FOI to receipt from a higher-level SSA or a receipt from the national level (SSA Rec) to calculate total receipts, it is important to note that a large portion of FOI likely comes from inbound tactical SSA retrograde. Indeed, for a certain portion of time, W2N brought in all retrograde as FOI. Thus, unserviceable tactical SSAs retrograde issues exceed unserviceable theater retrograde receipts by over four

times (41 percent unserviceable excess versus 10 percent unserviceable retrograde receipts; see Appendix E). The remaining 31 percent likely is partly contained within the 19 percent FOI pictured in Figure 6.1. Stated differently, unserviceable FOI at theater likely all or mostly consists of unserviceable retrograde coming from tactical SSAs.

In-theater repair and return to stock programs represent the biggest challenge for retrograde planners. While all other factors are driven by the support requirements of the combat force, sustainment-level maintenance, as discussed, can be located in or out of theater. This will, by necessity, change the workload of the SSA. During OIF, two distinct periods of activity corresponded to before and after the establishment of an in-theater repair and return to stock capability in 2006. These periods are represented by split percentages. Before the establishment of in-theater repair and return to stock, 11 percent was issued to maintenance activities and 11 percent was returned in total, with 10 percent returned unserviceable. This loop was likely entirely inspections and resulted in very little serviceable materiel. After the establishment of in-theater repair and return to stock, 20 percent was issued to maintenance, with just 7 percent returned unserviceable and 11 percent returned serviceable.

While it appears in Figure 6.1 that maintenance activities are sending repaired items directly to the serviceable SSA, this is a simplification. At the theater level (where most of the repair and return to stock activity occurred), repaired items are returned to the unserviceable SSA (because that is the SARSS activity that created the work order and assigned the corresponding due-in date from maintenance), which then directs them to the serviceable SSA, where they are transferred to the stock record account and made available for issue.

Another simplification is the retrograde process out of the theater retrograde SSAs. Retrograde issues in CTASC do not contain the ship-to RIC; therefore, it is unclear whether they are leaving the theater or simply being transferred. To remedy this, issues were matched with receipts. Therefore, the serviceable retrograde pictured as a return from maintenance is actually retrograde from the unserviceable SSA matched with a receipt at the serviceable SSA. Similarly, serviceable retrograde from the serviceable SSA is the net retrograde that left theater. Isolating the net transfers out of theater shows that 13 percent of unserviceable and 1 percent of serviceable materiel left theater before the establishment of an in-theater repair and return to stock capability. Not surprisingly, when that capability was established, the amount of unserviceable retrograde decreased to from 13 to 6 percent. Serviceable retrograde increased from 1 to 5 percent during this time, likely as a result of the drawdown and because greater quantities of serviceable items were being returned from maintenance.

At the serviceable SSA, many of the same complications as in the unserviceable SSA occurred. Principal among them is the inflow versus outflow disparity for FOI, SSA receipts from wholesale, and retrograde receipts. Here, too, retrograde receipts made up only 10 percent (see Appendix F), compared to 37 percent for tactical SSA retrograde issues. This leaves 27 percent unaccounted for, nearly the value of SSA receipts (13 percent) and FOI (11 percent) added together. When SSA receipts from wholesale and FOI are added to retrograde receipts, the

numbers are in balance. In this case, a large number of receipts, particularly from WLG, had been miscoded, but it is likely that a portion of receipts was coded correctly. This can be verified by noting that total serviceable outflows from the theater SSA are approximately 38 percent (4 percent retrograde, 1 percent DDS, 27 percent forward issue, and 6 percent customer issues), meaning that more than just 37 percent in materiel stemming from SSA retrograde entered into the SSA (there were also increases in stock during that time).

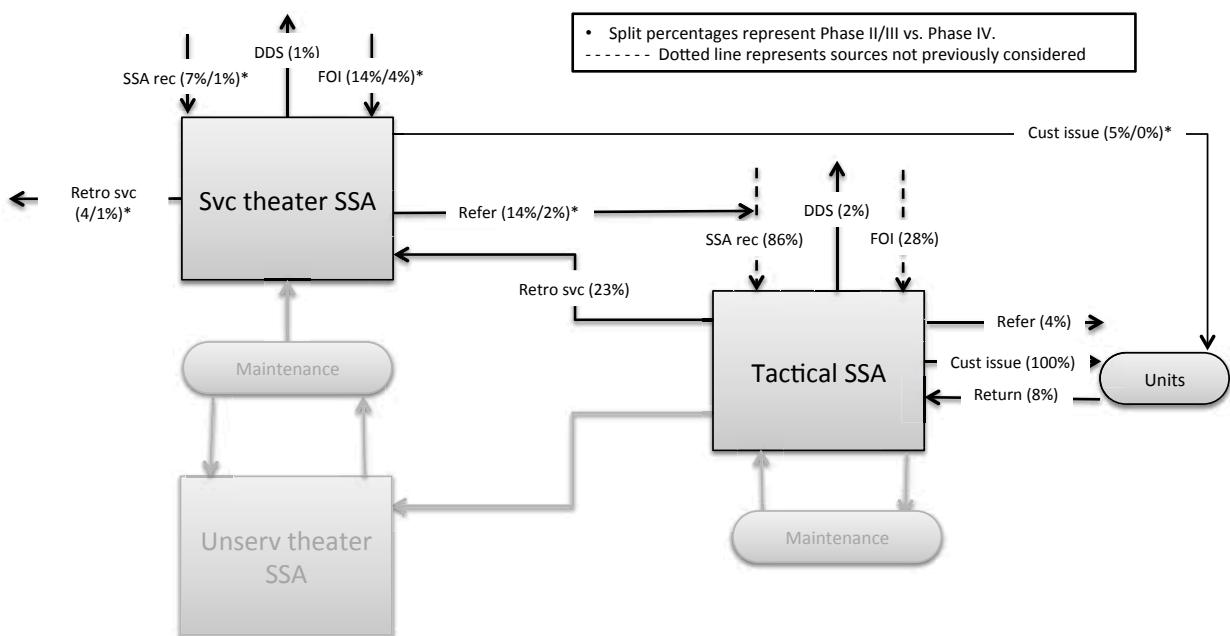
Some SSA receipts and serviceable retrograde was redistributed in the form of forward issues and customer issues. While forward issues are part of the forward stocking and redistribution mission of the theater SSA, customer issues may or may not be. Early in the conflict, theater SSAs had customers that they directly supported. These were taken away over the course of the conflict. The result was a decline from 9 to 1 percent in customer issues.

## Class II, IIIP, and IV

When studying the results, it is easiest to group Classes II, IIIP, and IV together because the metrics are, for the most part, indistinguishable. Any caveats to this statement will be expanded on later.

As Figure 6.2 shows, for planning purposes, Class II, IIIP, and IV (non-Class IX) retrograde is strictly serviceable. While we see very limited amounts of unserviceable, these are negligible and do not drive workload. It follows that maintenance is similarly negligible.

**Figure 6.2. Class II, IIIP, and IV Retrograde Map**



Just as in the case of Class IX, comparing materiel inflow to outflow at the tactical SSA for non-Class IX materiel, we see that tactical SSAs take in more than they issue to customers. Adding SSA serviceable receipts (86 percent) to serviceable FOI (28 percent) and serviceable returns (8 percent), we see that a tactical SSA takes in 121 percent of customer issues (see Appendix F). This accounts for the relatively large percentage of serviceable retrograde.

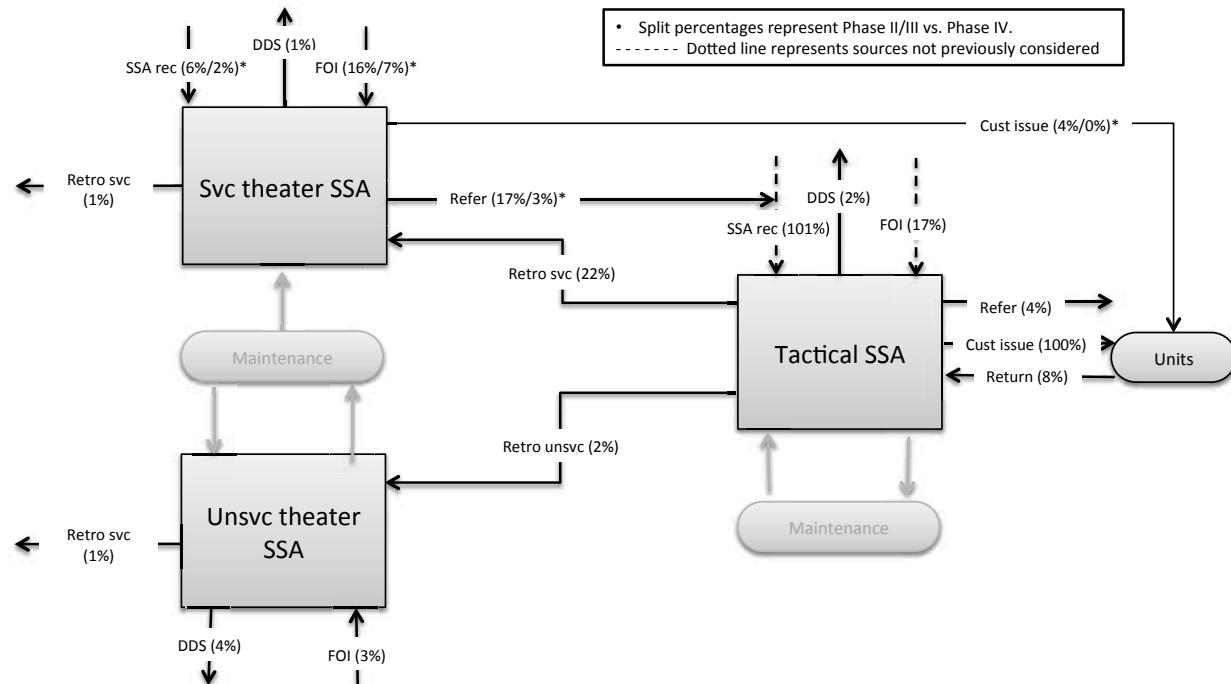
At the theater SSA, things are also similar to Class IX. Again, very little serviceable retrograde makes it to the theater SSA in the form of a retrograde receipt. Most retrograde is likely showing up in the form of FOI, with a limited quantity showing up as miscoded SSA receipts, mostly from WLG. That being said, the SSA receipts for non-Class IX appear to be largely legitimate.

In the early phases of the conflict, the theater SSAs directly supported some customers. As noted, these were taken away over the course of the conflict, reducing customer issues from 5 to 0 percent. A similar drop, from 14 to 2 percent, occurred in referral issues with the declining requirements of Phase 4.

## *Class II*

Because of its nature, Class II is not generally retrograded outside the theater but does retrograde to the theater SSA (see Figure 6.3).

**Figure 6.3. Class II Retrograde Map**



As with most non-Class IX retrograde, very little Class II retrograde is unserviceable. Unserviceable was, however, included because the amounts are not entirely insignificant.

### *Class IIIP*

Class IIIP is notable for the relatively large amount of theater SSA receipts, which was approximately double that of other non-Class IX materiel (see Figure 6.4).

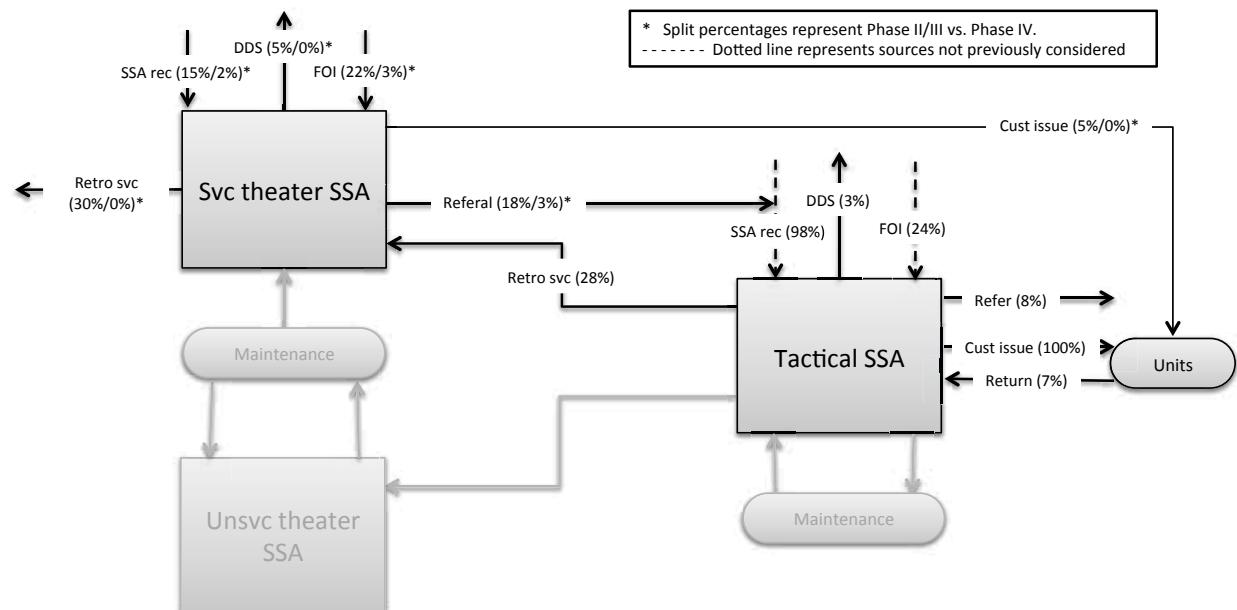
### *Class IV*

Class IV represents the biggest departure from the other non-Class IX classes, most notably in tactical SSA retrograde (see Figure 6.5).

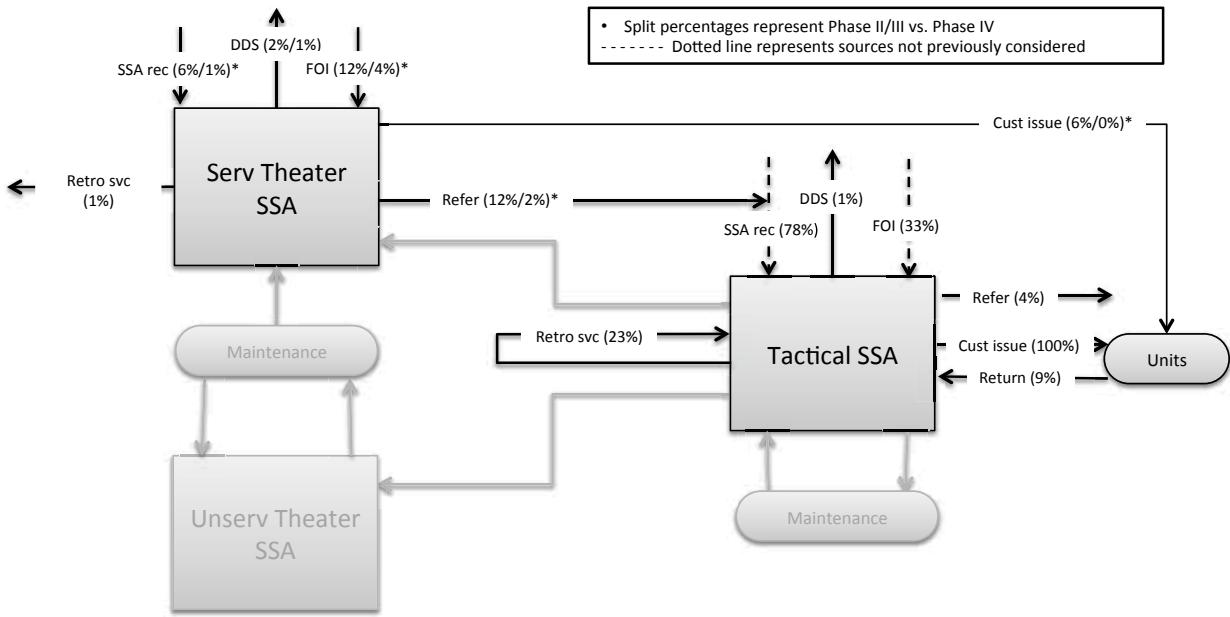
As previously discussed, Class IV materiel was brought “on the books” in 2008. This action resulted in a very high quantity of tactical SSA FOI and retrograde. However, retrograde was limited to in country movement to regional SSAs, depicted as an arrow looping back to the tactical SSA and verified by the 23 percent retrograde receipt rate at those SSAs. Consistent with doctrine, no Class IV retrograde of any significant quantity was moved out of country.

The other notable aspect of Class IV materiel movement is the relatively high rate of FOI at the theater level. It is unclear from our analysis the cause of the high FOI rate, as pseudo-receipts were not abnormally high.

**Figure 6.4. Class IIIP Retrograde Map**



**Figure 6.5. Class IV Retrograde Map**



## Class V

Because only three years' worth of data were available, the Class V retrograde planning factors for ASP and ATHP (see Figure 6.6 and Appendix I) are based on Afghanistan alone. Iraq data were used to inform drawdown figures but were too unstable to deduce any trends related to ongoing operations. With that caveat, the Afghanistan figures were stable, despite declining absolute volumes of materiel movement. Figure 6.6 shows three-year totals, except for TSA retro, FOI, and turn in, which are based on 2009 data that more accurately represent sustainment operations for the entire theater.

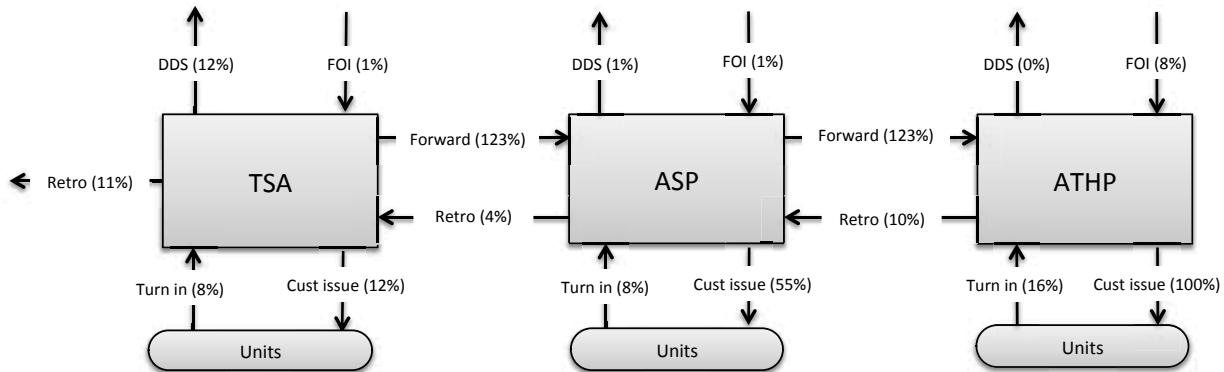
### *Sustainment Operations*

The first remarkable similarity between Class V supply and SSAs is the consistent oversupply of lower-level organizations. Both ASPs and ATHPs received 123 percent of customer issues over time. While we did not evaluate stock levels for Class V, it does appear that lower-level organizations are keeping this oversupply on hand.

Turn-in rates were higher at the ATHP than at the TSA or ASP but not dramatically so. This likely resulted in the higher rate of retrograde back to the ASP. The retrograde rate out of the ASP, however, was significantly lower because the ASP retained a large portion of serviceable retrograde and only passed through the unserviceable portion of retrograde.

These figures, however, had several notable exceptions that resulted from isolated incidents. A large spike in serviceable FOI occurred at the ATHP in Sharana (W90RPJ) in September 2009

**Figure 6.6. Class V Retrograde Afghanistan**



that, by itself, would have caused the FOI figure for ATHPs to increase to 18 percent for that year and to 8 percent overall. This spike of 1.1 million pounds consisted mostly of 155MM, 120MM, and 105MM projectiles. The second largest month for that ATHP was 65,000 pounds. While initially removed, these shipments were later included, as shipments would likely have still occurred but would have been spread over time in an alternate distribution model.

In 2011, a series of serviceable retrograde spikes from Sharana, Solerno, Shank, and Jalalabad caused the overall serviceable retrograde figure to increase to 19 percent for that year and 10 percent overall. Again, 155MM projectiles were a major contributor. This figure, however, is likely related to the shutdown of peripheral ATHPs, which increased the retrograde from 777,000 pounds to 2.1 million pounds between 2010 and 2011. A similar spike emerged in 2012 as well, but in both cases, ASP retrograde did not ramp up.

Finally, one unserviceable retrograde spike of 416,000 pounds occurred from Bagram (W9119L) to Kuwait (W81P6D) in December 2011. It is unclear what would have prompted the movement of unserviceable materiel out of country, although there was precedent for this spike, as we saw spikes of 209,000; 270,000; and 218,000 pounds from Bagram to Kuwait in July 2009, October 2011, and September 2010, respectively. Accordingly, this spike was not removed from the final 4-percent figure.

### *Drawdown*

The data from Joint Munitions Command cover 2009 through 2012 and therefore include the Iraq drawdown. While this made the data unusable for deducing trends for sustainment operations in Iraq, it did reveal several insights on the drawdown.

The Iraq drawdown appears to have caused a one-time spike in theater customer turn-ins and FOI, producing retrogrades of 51 and 53 million pounds respectively, likely as units passed through and dropped off combat loads and stocks. The total spike was equal to more than 100 million pounds of Class V, which appears to be equal to approximately two years' worth of

demand. Additionally, approximately one years' worth of demand (47 million pounds) was retrograded out of the theater SSA, and another one-fifth of a years' worth of demand (11.7 million pounds) went to DDS.

This gives a rough approximation of the stocks in theater at the time of withdrawal and the subsequent retrograde effort. What is important to note is that, unlike other classes of supply, there does not appear to have been an effort to manage the drawdown of Class V through attrition over time. This resulted in a large drawdown spike that did not occur with other classes.

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## 7. Discussion with Supply Officers

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The development of retrograde planning factors during this effort has, to a large part, relied on the use of real-world data. This approach naturally relies on several assumptions, most importantly that data were available, that the data accurately reflect the situation on the ground at the time they were recorded, that resources did not constrain operations to suboptimal levels, and that the current data set is indicative of future operations. This document has already mentioned areas that test some of these assumptions.

This section will discuss these areas, relying heavily on commentary from supply officers gathered through a series of dedicated discussions about operational workloads, efficacy, and required resources.

### Workload

In the discussions with supply officers, there was widespread agreement that retrograde contributed 45 percent of total SSA workload. This observation agrees with the results of the data analysis and was consistent across unit types and locations. The uniformity of the response also brings credibility to the use of “percentage of customer issues” as a meaningful metric. However, questions arose about whether SSAs were staffed sufficiently to handle this workload.

### *Staffing*

As previously described, tactical SSAs were generally staffed with 25 to 30 uniformed military personnel, sometimes augmented by approximately five contractors. While officers reported “making it work,” there was widespread consensus that staffing levels were inadequate to achieve 24/7 operations at a satisfactory two-way standard. Officers estimated that a tactical SSA needed a minimum of 40 people. The cited reasons for this level of staffing included the requirement for 24/7 operations and unpredictability of turn-in quantities.

In stateside operations, SSAs are able to control the timing of turn-ins by scheduling appointments and are able to reject turn-ins with improper documentation. Deployed SSAs have neither of these options, particularly in the case of units convoying past the SSA. In these situations, units may drop off large quantities of retrograde at any time of the day and with varying levels of documentation.

Insufficient staffing at the SSA was reported to have resulted in turn-ins being dropped off with limited accountability, leading to several second-order affects. Without appropriate classification ability, some improperly documented turns-ins may have ended up with DDS. Moreover, when the quantity of retrograde was significant, it may not have been processed at all, with the containers being left behind.

### *Left-Behind Containers*

Numerous supply officers independently raised the issue of left-behind containers, both as a frustration and as an area data would overlook. While there are many theories about the sources of these left-behind containers, none are verifiable. One frequently cited source was units exiting the theater and leaving containers behind. This was further blamed, in part, on the difficulty of turning in retrograde because of limitations on the number of transactions contractors could process or because of documentation requirements. Regardless of the source, it is clear that a large amount of multiclass retrograde, likely including commercial and nonstandard equipment, was processed in the form of left-behind containers.

Processing left-behind containers generally took two forms: (1) Major end items were either brought onto account by the RSY or RPAT yard, or (2) containers were opened, checked for hazardous materiel and weapon systems, and sent to Kuwait or Sierra Army Depot without proper classification. The latter path thus masked some retrograde that would otherwise have been included in the analysis.

In an attempt to mitigate the resulting accounting problems, teams were tasked with classifying the contents of left-behind containers. Despite this ad-hoc mitigation strategy, no organization currently exists for classifying such containers. There are, however, historical examples of such organizations, notably the collection, classification, and salvage units of the Vietnam War era.

### *Reporting Relationships*

While internal leadership at both types of SSAs reported facing few major organizational hurdles, with the exception of the cited need for more 920Bs, interviewees cited leadership complications related to the external chain of command. Accountable officers reported not knowing who to go to for support because their area support mission may have made them respond to multiple organizations, such as USAMC, combat brigades, and the support brigade. Additionally, NCOs may have come from yet another organization. This matrix of relationships resulted in an unclear SSA support structure, confusion for SSA leadership, and operational inefficiencies.

### *Contracting*

Interviewees also cited contracting as a significant frustration for SSA leadership, but this constitutes an opportunity for immediate improvement in the quality of contractor support. Officers were broadly complimentary of their contract personnel augmentation but were critical of several aspects of the written contracts and contractor language skills.

## **Written Contracts**

Limitations in the written contracts appear to stem from differences between stateside procedures and deployed operations. Most notably, officers reported that contracts were written according to transactions per day and number of lines on hand. Furthermore, contractors tended to stick very closely to the contract restrictions. While stateside procedures may allow SSAs to level workloads by setting a daily limit on the number of transactions that can be processed, similar leveling cannot always be accomplished in a combat environment because of the aforementioned inability to turn away units and request later materiel drop-off or pickup. This reportedly resulted in days where turn-ins or materiel release orders were not processed because contractors had reached their contractual transactional limitations. Specific examples were provided in which contractors rejected turn-ins due to contract limitations. The officers interviewed further speculated that these rejected turn-ins likely ended up as abandoned materiel, likely left behind in containers. Mitigation of the effects of daily transaction limits within SSA support contracts is a noted area for further exploration and possible remedy.

## **Accountability**

To help clarify the reporting relationships within SSAs, some officers suggested making the 920B Warrant Officer the contract officer representative (COR) because the warrant officers currently lack an effective enforcement mechanism. Other officers rejected this notion, citing that making the accountable officer or the 920B the COR would put the accountable officer/920B in the position of evaluating their own effectiveness. While we did not attempt to evaluate this relationship, it does not appear that the accountable officer would by necessity be “evaluating their own effectiveness.” It should also be noted that the 920B receives COR training in the basic and advanced courses.

## **Language Skills**

Another frequent complaint was contractor language skills. It appears that contracts with third-country nationals dictated language capabilities, but these were not specifically measured against determinable criteria. As a result, foreign nationals often had insufficient English-speaking abilities. Two potential solutions include demonstrable metrics and interpreter training for supply soldiers.

## **Resource Limitations**

Officers cited numerous areas for improvement in terms of resources. The most frequently cited sources are enumerated here.

### *Classify, Prepare, and Pack*

Doctrinally, the SSA classifies, prepares, packages, documents, labels, and produces radio frequency tags for retrograde items for shipment. However, current SSAs are not specifically trained or equipped for most functions of classification, preparation, and packaging.<sup>22</sup> While the sustainment brigade SSA has a packaging section, BSB SSAs (where most of the retrograde originates) do not have a packaging section. None of the SSAs have classification capabilities—doctrinally, the materiel is to be classified at the organization level before being turned in to the SSA. If materiel is not classified before being turned in or if reclassification is required, the SSA has traditionally relied on the expertise of the supporting maintenance company in materiel classification.

To mitigate this capability gap, current force structure relies on units to perform many of the retrograde functions. In a noncombat environment, this has worked effectively. Stateside, SSAs are able to schedule turn-in appointments and are able to reject turn-ins that do not meet Army regulations for preparation and packing or lack proper documentation, including a classification tag (DD form 1577-2 or equivalent). However, a combat environment greatly degrades an SSA's ability to reject a turn-in. As several supply officers noted, SSAs often will not, and likely should not, reject turn-ins, particularly in more-austere areas when units are convoying through. Regardless of doctrine, this places the onus on the SSA to handle classification, preparation, and packing.

Given that SSAs have no ability to classify, prepare, or package retrograde, knowledgeable maintenance officers, where available, handled classification. When knowledgeable maintenance officers were not available, one reported effect was that items not in original pack and commercial items were sent to DDS, regardless of condition.

Additionally, the lack of resources for cleaning and packing means that materiel may be thrown into multipacks and become damaged in transit. Another such example is the potential for expensive electronic components to be packed using non-statically neutral bubble wrap, which may lead to their destruction.

The ad-hoc solution in the theater was the use of the nearest support maintenance activity for classification functions. This solution be codified in doctrine. The packing section and equipment currently authorized on the Modified Table of Organization and Equipment of the quartermaster company should be added to the BSB SSAs.

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<sup>22</sup> ATTP 4-0.1 (FM 100-10.1), 2011, para. 2-42:

Retrograde equipment and materiel [are] consolidated at the lowest level supply support activity (SSA) and reported through the support operations channels to the designated commodity manager for disposition instructions. The SSA packages, documents, labels, and produces RF tags for retrograde items for shipment based upon disposition instructions received. Transportation requirements for retrograde are synchronized with inbound transportation flow to maximize use of transportation platforms.

### *Forklifts, Container Handlers, and Facilities*

Another frequently cited resource limitation was forklift and container handler support. Officers noted a heavy reliance on contractors for forklift and cited organic forklift failure as a cause of work stoppages. Officers did not suggest adding more forklifts to the table of equipment but, rather, cited the need for access to forklifts when organic forklifts failed. A similar need was cited for container handlers. As with the forklifts, officers requested the ability to access additional container handlers when necessary.

Facilities also constrained retrograde operations. This appeared to be mostly the result of retrograde demands exceeding initial planning. Over the course of both conflicts, retrograde facilities expanded greatly despite a lack of appreciable increases in retrograde quantities.

### **Missing Data**

The lack of data on left behind containers and the limited amount of Class V data have already been discussed. Class V data covered only three years and thus did not capture sustainment operations in Iraq. Accordingly, the Class V planning factors are based only on one conflict. These figures will need to be revisited in the event of a future conflict to ensure the lessons from Afghanistan are extensible.

Another major source of missing data was Class VII. Class VII materiel is accounted for in PBUSE and is transferred directly between PBUSE users. Accordingly, we do not have an accurate historical record of either the stock on hand or transfers. One proposed solution to this was to look at transportation data for Class VII leaving Kuwait. While this risks comingling retrograde from Afghanistan and Iraq, we were able to isolate Iraq retrograde during the drawdown by removing the weight of materiel transferred from Afghanistan, which by definition had to use transportation, which would require transportation requests and documentation of what was hauled that may have been archived.

The use of transportation data to measure Class VII materiel movement is unreliable and simply provided a ballpark estimate of Iraq retrograde. This is therefore a key area for further analysis. That said, there was little Class VII retrograde from Afghanistan, leading to the conclusion that Kuwait retrograde to CONUS originated in Iraq. In-transit visibility data suggest a volume of about 200 million pounds from 2009 through 2011 and likely more for 2012. This puts the total Iraq withdrawal at between 800 million and 1 billion pounds.

What is most interesting about Iraq is that the Kuwaiti safe haven extended the time available for the drawdown. A similar safe haven may or may not be available in future conflicts.

## **Areas for Revisit and Revision**

Significant areas exist for revisit and revision, particularly as new data and data systems become available. These areas include Class VII and Class V, which suffered from significant data limitations.

### ***Class VII***

Only a ballpark estimate was provided for Class VII in this effort. However, significant potential exists for revising this as the United States withdraws from Afghanistan. Inventory data, such as that contained in PBUSE, could be used to assess the amount of materiel on hand. Inventory and retrograde could then be measured, either through continuous tracking of inventory or through tracking of transfers. To arrive at a better estimate, Class VII drawdown figures, both for during the OIF drawdown and after, should be revisited.

### ***Class V***

Class V figures came from an extremely limited time frame because Army recordkeeping regulations only require warehousing three years' worth of data. It does not appear as though older data have been transferred to the LOGSA Information Warehouse for longer retention at this time. The Army G4 should work with the G-6 and the administrative assistant to the Secretary of the Army to explore a way under the provisions of Chapter 8 of Army Regulation 25-1 (2013) to maintain electronic records of all wartime logistical transactions for a minimum of ten years and to use any additional data to update the Class V metrics.

The limited period for which data were available made it difficult to establish a baseline. Thus, any perturbations to the factors either had to be ignored or included in entirety. Moreover, all data from Iraq were assumed to be part of the drawdown. While that is a safe assumption, no Iraq sustainment data were available for comparison with sustainment operations in Afghanistan. Similarly, we did not have Afghanistan drawdown data for any comparison to the drawdown in Iraq. Revisiting these estimates after the Afghanistan drawdown will at least provide one of these comparisons.

## **Factors That Could Drive Significant Changes in the Figures**

### ***GCSS-Army***

GCSS-Army represents a dramatic shift in the Army's information technology infrastructure. Once the system has been implemented, it will likely change the nature of many transactions fundamentally; new transaction types will likely become available; and some old transactions will disappear. While this will not directly affect the underlying methodology developed in this report, it will significantly affect some aspects of it, its implementation, and the planning factors.

One area of particular concern is the lack of an automated excess process in GCSS-Army. GCSS-Army uses a “deliberative excess process,” which may result in retrograde surges that could dramatically affect not only the timing but the quantity of retrograde. Furthermore, it has been argued that implementation of GCSS-Army may reduce inefficiencies in the supply chain and cause a corresponding drop in retrograde. If this materializes, retrograde planning factors will need to adjust accordingly.

#### *Controlled or Uncontrolled Drawdown in Afghanistan*

One area not mentioned explicitly in this report is that, for sustainment in Iraq, there was no noticeable change in planning factors as the drawdown began. However, for Classes V and VII, there was a large and significant spike. This is due to a carefully constructed plan of materiel attrition coinciding with SSA shutdowns. By selecting SSA shutdown dates well in advance, planners were able to manage SSA stocks as shutdown approached.

It is currently unclear whether such a plan exists in Afghanistan. If not, sustainment metrics during Phase IV may be significantly higher in Afghanistan than they were in Iraq. Indeed, the limiting factor for retrograde coming out of Afghanistan may be transportation capacity, not materiel.

Inversely, if a shutdown plan were constructed for ASPs and ATHPs and stocks were carefully managed moving into the shutdowns, we might find no spike associated with Class V materiel at drawdown.

Both of these possibilities represent areas for revisit once additional data from Afghanistan become available.

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## Appendix A. SARSS Transactions

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The following section will provide a primer to SARSS transactions, their abbreviations used in the software code (in the parentheses), and their technical definitions. Several fields exist that are universal to all transactions:

- DIC: a three-digit code identifying a given transaction and its intended purpose and usage
- Document number (docno): a unique 13-digit code given to each transaction
- Routing identifier code (ric): a three-digit code assigned by services/agencies for processing interservice/agency and intraservice/agency logistics transactions
- DODAAC (dodaac): a six-digit code that identifies a military unit, activity, or organization that has the authority to requisition and/or receive materiel
- NIIN (niin): a nine-digit numeric code which uniquely identifies an item of supply in the North Atlantic Treaty Organization (NATO) Codification System
- Condition Code: a one-digit alphabetic code that identifies the item as either serviceable or unserviceable.<sup>23</sup>

### Issues (Materiel Release Orders)

Materiel release orders are indicated by DICs starting with A5 and include both reimbursable and nonreimbursable issues. Three issue DICs are of interest to retrograde:

- A51: a materiel release order for overseas shipment with NSN/NATO stock number
- A5A: a materiel release order for domestic shipment with NSN/NATO stock number
- A5J: a disposal release order from ICP to storage activity for shipment to DDS.

For the purposes of retrograde, six different types of issues are of interest:

- Customer issue (Cust Issue): This issue occurs between an SSA and a customer. Generally speaking, this will only occur at an SSA with a direct support mission. This transaction officially moves the item out of the supply accountability system. Below this level, the item will be recorded in the unit's property book, in SAMS, or in the Unit Level Logistics System—Aviation. Customer issues are indicated by a DIC of A5A or A51 with MGRCDMRO of "B" or "I" and a non-SSA DODAAC.
- Referral (refer): This issue occurs between an SSA and another SSA, such as when a theater SSA issues retained stock to a tactical SSA. This transaction shifts the location of an asset within the Army Working Capital Fund but does not transfer it to a customer. Referrals are indicated by a DIC of A5A or A51 with MGRCDMRO code of "A" or "R."

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<sup>23</sup> For the purpose of this project, *serviceable* is defined as any item that is condition code A, B, or C, as follows:

- A: issuable to all customers; new, repaired, reconditioned
- B: issuable for its intended purpose; restrictions apply
- C: priority issue; issue to selected customers.

- Retrograde (retro): This issue is similar in structure to a forward issue, in that it moves stock between two SSAs, but this transaction shifts inventory from a lower-level SSA to a higher-level SSA. A transaction of this type can be identified either by an MGRCDMRO code of “E” or description of the item as unserviceable. Unserviceable items should never be issued forward, so by definition, they are local excess. Retrogrades are indicated by a DIC of A5A or A51 with MGRCDMRO code of “E” or condition code not in “A,” “B,” or “C.”
- DDS: Also included in retrograde, this is an issue to DDS for reutilization and disposal. These are indicated by a DIC of A5J.
- Issue to maintenance (Iss Maint): By definition, issues to maintenance are not issues but rather are transfers of stock to maintenance for inspection, testing, or repair. This generally occurs at the theater level, with limited activity at the regional level. Issues to maintenance are indicated by a DIC of XML.
- Transfer (transf): Transfers move materiel from a theater-level SSA to another theater-level SSA. This field was added to separate serviceable retrograde from the unserviceable theater SSA because of serviceable receipts from maintenance but was generalized to all such transfers. Transfers are indicated by documents originating from W2N, W2Q, W6Z, W7A, A4X, W6U, W8C and received at another SSA in theater.

## Receipts

A DIC code beginning with D6 indicates a receipt. There are two types:

- Materiel receipts are for sources other than procurement instruments.
- Materiel receipt acknowledgments document receipt of wholesale materiel.

For retrograde, six different types of receipts are of particular interest:

- SSA receipt (SSA Rec): SSA receipts acknowledge receipt of materiel from a higher-level SSA, which can be thought of as forward distribution. They include serviceable items. SSA receipts that are acknowledged in a customer document number are dedicated,<sup>24</sup> meaning that they are destined for a specific customer and are not replenishment to the SSA. This is important because most SSA receipts are replenishments as per the request order number–document order number process.<sup>25</sup> SSA receipts are indicated by a DIC of D6S or D6U.
- FOI: FOI is a receipt for an item that is found on site without documentation and can be caused by both the forward and reverse pipelines. While not directly retrograde, FOI may lead to retrograde. In theory, this should be a rare transaction that occurs only in unusual circumstances. In practice, FOI receipts are common. While it cannot be definitely proven from the data, the main sources of FOI appear to be pseudo-receipts in the forward pipeline and unserviceable receipts at theater. Particularly for surface shipments,

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<sup>24</sup> The first six digits of the document number is a customer DODAAC.

<sup>25</sup> In the RON-DON process, any customer requisition that cannot be fulfilled using SSA inventory is ordered by the SSA on a separate document number. This document appears as replenishment regardless of whether the item is stocked at the SSA or not stocked.

items will frequently hit the pseudo-parameter,<sup>26</sup> even though they are still in route. Since the pseudo-parameter closes the transactions, the items may be receipted on an FOI.

Similarly, many shipping labels fell off shipments destined for W2N. This became so prevalent that, for a time, W2N brought nearly all retrograde shipments in as FOI by policy. FOIs are indicated by a DIC of D6A with an advice code or return advice code of 1F and an SSA DODAAC.

- Retrograde receipt (retro-r): This is the receipt of retrograde from another SSA and is the corresponding transaction to a retrograde issue. Occurs exclusively at regional or theater SSAs, except for the rare case during drawdown operations where a tactical SSA shuts down and excesses their stock to a nearby tactical SSA. A retrograde receipt is indicated by an DIC of D6K with a management code (MGT\_CD) of "f" and is from another SSA.
- Return (return): This is the return of materiel from a customer to the supporting SSA. A return is indicated by a DIC of D6A or D6R without an ADCDRAC code of 1F and is from a customer.
- Receipt from maintenance (Rec maint): This refers to SSA receipt of materiel as a result of repaired or tested items being returned from a commercial or government repair facility. This should predominantly occur at the theater SSA because the National Maintenance Program operates exclusively at that level and above. In practice, certain NIINs were repaired at the regional levels, such as items repaired at the Tire Assembly Repair Program (TARP). It is unclear whether this practice will continue to occur at regional SSAs (if they exist) in future contingencies. It should be noted that receipts from maintenance are questionably retrograde; it can be argued that they are actually part of the forward pipeline but are included here for completeness. A receipt from maintenance has a DIC of D6M
- Pseudo Receipt (pseudo): This is a paper transaction to close out a pending due-in item, generally used if the item is missing in transit or has exceeded its due date by a specified number days. A pseudo transaction has a DIC with a management code (mgt\_cd) of g or r.

## Inventories (on Hand and Authorized Stockage List)

Each SSA can have an ASL that includes the quantities of items that particular SSA may have on-hand or on order to meet customer demand. Items not on that list are considered NSL. While not directly related to retrograde, changes to the ASL or shutdown of SSAs can both result in retrograde. This is particularly important during drawdown operations, when customers and even whole SSAs are leaving the AO.

SSAs manage stock according to standard inventory models:

- Requisition objection (RO): The RO is the maximum quantity of the item authorized to be on hand and on order at any time.
- Reorder point (ROP): The ROP is the point at which the SSA will generate replenishment for quantity needed to reach the RO.

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<sup>26</sup> A parameter in SARSS that signifies the time after which a shipment will be pseudo-receipted; typically 45 days for air and 90 or 120 days for surface, although dependent on prescribed mode of transport and class.

- Retention level (RL): The RL is the level of materiel authorized to be on hand above the demand supported ROs. Any amount over this threshold will be excessed. It follows that, when the RL for a particular NIIN is lowered on the ASL, the stock on hand over the new RL will be identified for retrograde. Similarly, any receipt transactions that would cause the stock to exceed the RL, including NSL NIINs with an RL of zero (0), would result in retrograde.

## Appendix B. SAAS-MOD Transactions

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Many transaction types contributed to the development of Class V retrograde metrics. This appendix is a primer for SAAS-MOD transactions and their technical definitions.

Several fields are universal to all transactions:

- Transaction code (TRAN\_CD): a three-digit code identifying a given transaction and its intended purpose and use
- Document number (DOCNO): a unique 13-digit code given to each transaction
- DODAAC: a six-digit code that identifies a military unit, activity, or organization that has the authority to requisition and/or receive materiel
- NSN: a 13-digit numeric code that uniquely identifies each item of supply purchased, stocked, or distributed within the federal government and within the NATO Codification System
- Condition code: a one-digit alphabetic code that identifies the item as either serviceable or unserviceable.<sup>27</sup>

The transaction code is similar in function to the DIC from CTASC, except that SAAS-MOD uses 41 transaction codes that provide a more-detailed purpose for the transaction. The transactions used for this analysis are shown in Table B.1.

**Table B.1. SAAS-MOD Transactions**

Transaction Type	TRAN_CD	Description
Code/Mgmt Change	CCH	CONDITION CODE CHANGE TO H
	CMD	CMD CHANGE
Depot Shipment	LSH	LMP SHIPMENT
Destruction / DDS	DES	DESTRUCTION
	DMA	DEMO MATERIEL ISSUE FOR DEMIL
	IDK	ISSUE DEMIL HOST NATION INTEND >\$3,000
	IDM	ISSUE DEMIL US INTEND >\$3,000
	PDO	TRANSFER TO DDS
	IUV	ISSUE DEMIL US INTEND <\$3,000K

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<sup>27</sup> For the purpose of this project, *serviceable* is defined as any item that is condition code A, B, or C, as follows:

- A: Issuable to all customers; new, repaired, reconditioned
- B: Issuable for its intended purpose; restrictions apply
- C: Priority Issue; issue to selected customers.

**Table B.1—Continued**

<b>Transaction Type</b>	<b>TRAN_CD</b>	<b>Description</b>
FOI	FOI	FOUND ON INSTALLATION (AMNESTY)
Issue	IBL	ISSUE TO BASIC LOAD (INITIAL)
	IBR	ISSUE TO BASIC LOAD (REPLENISHMENT)
	ICO	ISSUE TO CURRENT OPERATIONS
	IHD	ISSUE TO HOMELAND DEFENSE
	IOL	ISSUE TO OPERATIONAL LOAD
	IRV	ISSUE DEMIL HOST NATION INTEND <\$3,000
	ITM	ISSUE TO US MARINES
	ITN	ISSUE TO US NAVY
	NIS	NORMAL ISSUE (FOR COMBAT)
	TIS	ISSUE FOR TRAINING
Issue Maint/Test	IFT	ISSUE FOR TEST
	ITR	ISSUE TO MAINTENANCE
Loss	LEA	LOSS DUE TO ENEMY ACTION/COMBAT
	LFE	LOSS DUE TO FIRE
Receipt	IIR	INTRASIT IN RECEIPT
Return Maint/Test	RFR	RETURNED FROM MAINTENANCE
	RFT	RECEIPT FROM TRADOC
Shipment	ICS	INTRA CORPS SHIPMENT
	IFS	SHIPMENT OUT OF CORPS
	LTS	SHIPMENT INTRA CORPS
	SHP	SHIPMENT (BASED ON DIRECTIVE)
Turn In	BLR	TURN-IN FROM BASIC LOAD
	NTI	NORMAL TURN-IN (COMBAT)
	RCO	TURN-IN FROM CURRENT OPERATIONS
	RHL	TURN-IN FROM HOMELAND DEFENSE
	ROL	TURN-IN OF OPERATIONAL LOAD
	RTF	RETURN FROM TEST
	TAR	TRAINING ASSET RETURNED
	TFM	TURN-IN FROM USMC TRAINING
	TFN	TURN-IN FROM USNAVY
	TIR	TURN-IN OF RESIDUE

## Appendix C. SSAs by Year

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Table C.1 lists the SSAs, by year, that were present in Southwest Asia during the Iraq and Afghanistan conflicts.

**Table C.1. SWA SSAs**

<b>RIC</b>	<b>DODAAC</b>	<b>Type</b>	<b>SSA Level</b>	<b>Location</b>	<b>Start</b>	<b>End</b>
A4X	W5J9DM	7	DOL/theater SSA	Afghanistan	2009	2011
A8M	W91CNC	3	Tactical SSA	Iraq	2003	2003
AK7	W81NNE	3	Tactical SSA	Kuwait	2002	2005
W01	W912UN	3	Tactical SSA	Iraq	2003	2005
W0F	W81T8T	3	Tactical SSA	Afghanistan	2002	2011
W0P	W91GLW	3	Tactical SSA	Afghanistan	2004	2011
W0V	W91J6U	3	Tactical SSA	Iraq	2004	2006
W0X	W91J6S	3	Tactical SSA	Iraq	2004	2010
W1B	W91Y3B	2	Tactical SSA	Iraq	2003	2004
W1B	W91Y3B	3	Tactical SSA	Iraq	2005	2009
W1C	W91XGF	3	Tactical SSA	Iraq	2003	2011
W1E	W91XPB	3	Tactical SSA	Iraq	2003	2009
W1H	W90V9R	3	Tactical SSA	Uae	2008	2011
W1K	W91YVR	3	Tactical SSA	Kuwait	2003	2003
W1M	W91XLM	3	Tactical SSA	Iraq	2003	2005
W1P	W90VPT	3	Tactical SSA	Afghanistan	2008	2011
W1U	W91Y5Q	2	Tactical SSA	Kuwait	2003	2003
W1V	W91X7E	2	Tactical SSA	Iraq	2003	2004
W1X	W91Y5S	2	Tactical SSA	Iraq	2003	2004
W28	W90Y0S	3	Tactical SSA	Afghanistan	2008	2011
W29	W90Z0G	3	Tactical SSA	Afghanistan	2009	2011
W2A	W90Z2Z	3	Tactical SSA	Afghanistan	2009	2011
W2C	W91YW8	2	Tactical SSA	Iraq	2003	2004
W2C	W91YW8	3	Tactical SSA	Iraq	2005	2007
W2C	W91YW8	3	Tactical SSA	Afghanistan	2008	2011
W2E	W91YZ7	1	Tactical SSA	Iraq	2003	2003
W2E	W91YZ7	2	Tactical SSA	Iraq	2004	2004
W2E	W91YZ7	3	Tactical SSA	Iraq	2005	2010
W2E	W91YZ7	3	Tactical SSA	Kuwait	2011	2011

**Table C.1—Continued**

<b>RIC</b>	<b>DODAAC</b>	<b>Type</b>	<b>SSA Level</b>	<b>Location</b>	<b>Start</b>	<b>End</b>
W2G	W91YVX	1	Tactical SSA	Iraq	2003	2004
W2G	W91YVX	3	Tactical SSA	Iraq	2005	2005
W2K	W91Z2A	2	Tactical SSA	Iraq	2003	2004
W2K	W91Z2A	3	Tactical SSA	Iraq	2005	2005
W2N	W91P9H	7	DOL/theater SSA	Kuwait	2003	2011
W2P	W91P9C	3	Tactical SSA	Kuwait	2003	2011
W2Q	W91PAM	7	DOL/theater SSA	Kuwait	2003	2011
W2W	W91PFK	3	Tactical SSA	Kuwait	2003	2005
W2W	W91PFK	3	Tactical SSA	Afghanistan	2007	2011
W2Z	W91YSX	1	Tactical SSA	Iraq	2003	2004
W2Z	W91YSX	3	Tactical SSA	Iraq	2005	2009
W2Z	W91YSX	3	Tactical SSA	Afghanistan	2010	2011
W31	W912Y2	3	Tactical SSA	Iraq	2003	2010
W36	W5J9T0	3	Tactical SSA	Afghanistan	2009	2011
W37	W5J9V5	3	Tactical SSA	Kuwait	2009	2011
W3F	W918AR	3	Tactical SSA	Iraq	2004	2010
W40	W55XGJ	1	Tactical SSA	Kuwait	2002	2002
W40	W55XGJ	3	Tactical SSA	Kuwait	2003	2006
W41	W81PLY	3	Tactical SSA	Kuwait	2002	2005
W42	W81TPR	2	Tactical SSA	Kuwait	2002	2004
W43	W81GXJ	3	Tactical SSA	Saudi	2002	2005
W44	WK4FF4	3	Tactical SSA	Saudi	2002	2005
W45	W5K9JQ	3	Tactical SSA	Afghanistan	2009	2011
W53	W56APX	3	Tactical SSA	Afghanistan	2010	2011
W6S	W91PLQ	3	Tactical SSA	Kuwait	2003	2003
W6U	W56JKU	7	DOL/theater SSA	Afghanistan	2011	2011
W6Z	W91QLS	7	DOL/theater SSA	Kuwait	2003	2009
W73	W915UX	3	Tactical SSA	Iraq	2004	2005
W7A	W91QSU	7	DOL/theater SSA	Kuwait	2003	2011
W7B	W91QU1	3	Tactical SSA	Jordan	2003	2003
W7G	W91RED	3	Tactical SSA	Kuwait	2003	2003
W7Z	W91RH2	3	Tactical SSA	Kuwait	2003	2011
W83	W91MM5	3	Tactical SSA	Kuwait	2003	2003
W8A	W91RUM	3	Tactical SSA	Kuwait	2003	2004
W8B	W91DGC	3	Tactical SSA	Romania	2003	2005
W8C	W91DXY	3	Regional SSA	Qatar	2002	2002

**Table C.1—Continued**

<b>RIC</b>	<b>DODAAC</b>	<b>Type</b>	<b>SSA Level</b>	<b>Location</b>	<b>Start</b>	<b>End</b>
W8C	W91DXY	7	DOL/theater SSA	Qatar	2003	2011
W8D	W91DX3	3	Regional SSA	Afghanistan	2002	2011
W8E	W91DY0	3	Tactical SSA	Afghanistan	2002	2011
W8G	W91EB8	3	Regional SSA	Afghanistan	2002	2011
W9E	W91RWM	3	Tactical SSA	Kuwait	2003	2003
W9Q	W91S2E	3	Tactical SSA	Kuwait	2003	2004
W9S	W91S15	3	Tactical SSA	Kuwait	2003	2003
W9X	W91CW9	3	Tactical SSA	Masirah	2002	2005
W9Z	W91RN4	3	Tactical SSA	Afghanistan	2003	2011
WA6	W91AHP	3	Tactical SSA	Iraq	2003	2005
WCR	W9136C	3	Tactical SSA	Iraq	2003	2004
WDT	W913KX	3	Tactical SSA	Iraq	2003	2011
WDU	W918AS	3	Tactical SSA	Iraq	2004	2005
WE2	W91Z4U	1	Tactical SSA	Iraq	2003	2004
WE3	W91Z4V	1	Tactical SSA	Iraq	2003	2004
WE7	W91XSS	3	Tactical SSA	Kuwait	2003	2003
WE8	W913WP	3	Tactical SSA	Iraq	2003	2006
WES	W91175	3	Tactical SSA	Iraq	2004	2011
WH9	W91047	3	Tactical SSA	Iraq	2007	2009
WHP	W91UQX	3	Tactical SSA	Kuwait	2003	2003
WJ3	W912BX	3	Tactical SSA	Iraq	2003	2007
WJ3	W912BX	3	Tactical SSA	Bahrain	2008	2011
WJ5	W91ZLZ	3	Tactical SSA	Kuwait	2003	2003
WJ5	W91ZLZ	3	Tactical SSA	Iraq	2004	2005
WJE	W9117P	3	Tactical SSA	Iraq	2006	2009
WJE	W9117P	3	Tactical SSA	Afghanistan	2010	2011
WFJ	W912E4	3	Tactical SSA	Iraq	2003	2004
WJZ	W912E7	3	Tactical SSA	Iraq	2003	2004
WKQ	W910M2	3	Tactical SSA	Kuwait	2004	2011
WKU	W9118B	3	Tactical SSA	Iraq	2007	2011
WKW	W9118J	3	Tactical SSA	Kuwait	2005	2007
WKW	W9118J	3	Tactical SSA	Afghanistan	2008	2011
WKY	W9118P	3	Tactical SSA	Iraq	2007	2010
WL1	W91SED	3	Tactical SSA	Iraq	2003	2005
WL5	W91SVE	3	Tactical SSA	Kuwait	2003	2003
WL6	W91SV4	3	Tactical SSA	Kuwait	2003	2003

**Table C.1—Continued**

<b>RIC</b>	<b>DODAAC</b>	<b>Type</b>	<b>SSA Level</b>	<b>Location</b>	<b>Start</b>	<b>End</b>
WLA	W9158A	3	Tactical SSA	Iraq	2003	2010
WLG	W91RXD	3	Regional SSA	Iraq	2003	2010
WLW	W91RXJ	3	Tactical SSA	Kuwait	2003	2003
WMP	W91T8C	3	Tactical SSA	Jordan	2003	2003
WMT	W91THB	3	Tactical SSA	Iraq	2003	2006
WMT	W91THB	2	Tactical SSA	Iraq	2004	2004
WMV	W91THG	3	Tactical SSA	Iraq	2003	2004
WMW	W91TD4	3	Tactical SSA	Iraq	2003	2004
WMY	W91X9E	3	Tactical SSA	Kuwait	2003	2003
WMZ	W91T1F	2	Tactical SSA	Iraq	2003	2003
WMZ	W91T1F	3	Tactical SSA	Iraq	2004	2010
WN1	W91T1H	2	Tactical SSA	Iraq	2003	2003
WN1	W91T1H	3	Tactical SSA	Iraq	2004	2005
WN6	W91T1S	2	Tactical SSA	Iraq	2003	2003
WN6	W91T1S	3	Tactical SSA	Iraq	2004	2005
WN7	W91T1U	2	Tactical SSA	Iraq	2003	2003
WN9	W91PPJ	3	Tactical SSA	Qatar	2006	2011
WP1	W91T24	2	Tactical SSA	Kuwait	2003	2003
WP1	W91T24	3	Tactical SSA	Iraq	2004	2005
WP3	W91ZKW	3	Tactical SSA	Iraq	2003	2011
WP6	W91T2E	2	Tactical SSA	Iraq	2003	2003
WP6	W91T2E	3	Tactical SSA	Iraq	2004	2010
WP7	W91X8J	3	Regional SSA	Iraq	2003	2011
WQ1	W91XDJ	3	Tactical SSA	Iraq	2003	2010
WQ6	W91TG1	3	Tactical SSA	Iraq	2003	2010
WQX	W91TJJ	3	Tactical SSA	Turkey	2003	2003
WRU	W9117G	3	Tactical SSA	Iraq	2004	2010
WRY	W91U4B	2	Tactical SSA	Iraq	2003	2005
WTR	W90YGB	3	Tactical SSA	Kuwait	2003	2004
WU4	W91UEM	3	Tactical SSA	Turkey	2003	2003
WU6	W91UDP	3	Tactical SSA	Turkey	2003	2003
WU8	W91UDQ	3	Tactical SSA	Turkey	2003	2003
WUA	W91UCE	3	Tactical SSA	Iraq	2003	2004
WUD	W91SKJ	3	Tactical SSA	Kuwait	2003	2004
WUG	W91ULA	3	Tactical SSA	Iraq	2003	2003
WUJ	W91USP	3	Tactical SSA	Iraq	2003	2007

**Table C.1—Continued**

<b>RIC</b>	<b>DODAAC</b>	<b>Type</b>	<b>SSA Level</b>	<b>Location</b>	<b>Start</b>	<b>End</b>
WUM	W91VA8	3	Tactical SSA	Iraq	2003	2004
WUN	W91V00	2	Tactical SSA	Iraq	2003	2004
WUQ	W91UVN	3	Tactical SSA	Iraq	2003	2003
WUS	W91UVP	3	Tactical SSA	Iraq	2003	2004
WUT	W91UVH	3	Tactical SSA	Iraq	2003	2003
WUW	W91V46	1	Tactical SSA	Kuwait	2003	2004
WUX	W91V4S	2	Tactical SSA	Iraq	2003	2004
WUZ	W91V47	2	Tactical SSA	Iraq	2003	2004
WV2	W91V4R	2	Tactical SSA	Iraq	2003	2004
WV7	W91V4E	2	Tactical SSA	Iraq	2003	2004
WVA	W91UVM	3	Tactical SSA	Kuwait	2003	2003
WVA	W91UVM	3	Tactical SSA	Iraq	2004	2009
WVE	W91W42	3	Tactical SSA	Iraq	2003	2011
WVL	W91VK5	3	Tactical SSA	Kuwait	2003	2004
WVN	W91W76	3	Tactical SSA	Iraq	2003	2003
WVP	W91WNX	3	Tactical SSA	Iraq	2003	2005
WVS	W91V4K	1	Tactical SSA	Iraq	2003	2004
WVT	W91V4M	1	Tactical SSA	Iraq	2003	2004
WVZ	W91WBY	3	Tactical SSA	Iraq	2003	2011
WW2	W91WBW	3	Tactical SSA	Kuwait	2003	2004
WW5	W91SR7	3	Tactical SSA	Kuwait	2003	2003
WWJ	W90YAR	2	Tactical SSA	Kuwait	2002	2004
WWL	W91VXY	3	Tactical SSA	Iraq	2003	2005
WYJ	W91FEB	3	Tactical SSA	Kuwait	2003	2004
WYN	W91FKA	3	Tactical SSA	Kuwait	2003	2004
WYX	W91K61	3	Tactical SSA	Djibouti	2002	2009
WZ6	W91EWG	3	Tactical SSA	Kuwait	2003	2003

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## Appendix D. Ammunition Supply Sites

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Table D.1 lists SWA ammunition supply sites.

**Table D.1. Ammunition Supply Sites**

DODAAC	Name	State	Location	Type	Region
W560JZ	0003 HQ HQ SSA FOB WILSON KDH	AF	Wilson	ATHP	SWA
W565XP	0003 HQ HQ SHINDAND SSA OA2	AF	Shindad	ATHP	SWA
W565XQ	0003 HQ HQ TARIN KOWT SSA TE2	AF	Tarin Kowt	ATHP	SWA
W5J9CG	0003 HQ HQ BASTION SSA 1 AZ1	AF	Bastion	ASP	SWA
W81B38	0003 HQ HQ USARCENT ASP MZR	AF	Camp Marmal (MES)	ATHP	SWA
W908UT	0003 HQ HQ JALALABAD MAIN JAA	AF	Jalalabad	ATHP	SWA
W90RPJ	0003 HQ HQ PRT SHARANA 2 AZ3	AF	Sharona	ATHP	SWA
W90W8T	0025 IN HQ STRYKER BCT KDH	AF	Kandahar	ATHP	SWA
W90ZRC	0003 HQ HQ FOB SHANK LSA OA5	AF	Shank	ATHP	SWA
W9119L	0003 HQ HQ ARCENT BAGRAM 1 OA1	AF	Bagram	ASP	SWA
W9119Z	0003 HQ HQ ARCENT KANDAHAR KDH	AF	Kandahar	ASP	SWA
W91806	0003 HQ HQ ARCENT SALERNO OA4	AF	Salerno	ATHP	SWA
W91CQU	0043 CS HQ SUST BDE WO	AF	Jalalabad	ATHP	SWA
W91MBF	0209 CS BN AV SPT LT BDE KDH	AF	Kandahar	ATHP	SWA
W91RNF	0801 CS BN CO A DIST BSB I AZ3	AF	FOB Sharana	ATHP	SWA
W91YWB	0003 HQ HQ USARCENT MAZAR MZR	AF	Mazar-e Sharif	ATHP	SWA
W904X0	0024 QM CO SUPPLY	IQ	Al Asad	ATHP	SWA
W905SP	0025 IN HHC 04 HQS BDE CBT TM OA4	IQ	Kalsu	ATHP	SWA
W90N8Z	0002 CS BN SPT BN SBCT	IQ	Balad	ATHP	SWA
W90QJC	0004 AR HQ 03 HQ HEAVY BCT	IQ	Iraq	ATHP	SWA
W911A4	0003 HQ HQ ARCENT ANACONDA	IQ	JBB	ASP	SWA
W9188Q	0003 HQ HQ ARCENT TALLIL	IQ	Tallil	ASP	SWA
W9188X	0003 HQ HQ CAMP LIBERTY	IQ	Camp Liberty	ASP	SWA
W91K7G	0003 HQ HQ A DIV FSB 2	IQ	Iraq	ATHP	SWA
W91K7K	0003 HQ HQ A DIV ASB 2	IQ	Liberty	ATHP	SWA

**Table D.1—Continued**

DODAAC	Name	State	Location	Type	Region
W91MPH	0426 CS BN CO A DIST BSB	IQ	Warrior	ATHP	SWA
W91MRK	0003 HQ HQ MOSUL	IQ	Marez	ATHP	SWA
W91NZC	0626 CS BN CO A DIST BSB I	IQ	Iraq	ATHP	SWA
W91RQ8	0000 AV HHC CBT AVN BDE HVY	IQ	Taji	ATHP	SWA
W91T42	0407 CS BN HHC BSB IBCT	IQ	Al Asad	ATHP	SWA
W91Z5N	0041 FA HQ FIRES BDE	IQ	Bagdad	ATHP	SWA
W80TB5	W4JQ USA ELE CDR STF MFO TLV	KU	Telaviv	ATHP	SWA
W81P6D	W47T AREA SPT GRP KUWAIT KWI	KU	Kuwait	TSA	SWA
W91VKS	0003 HQ HQ CAMP UDAIRI KWI	KU	Kuwait City	ASP	SWA

## Appendix E. Planning Factors by Class for Notional Retrograde Phases

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Table E.1 provides a detailed breakout of all planning factors by class, including transactions that are not otherwise included in planning factors, such as pseudo-receipts and changes to on hand (ohdelta). Multiplying the factors by demand estimates will provide the complete flow of materiel throughout the AO.

**Table E.1. Planning Factors by Class**

Class	Type	Cond	Phase	Cust							Rec	SSA	Iss
				Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)			
2	Tac	Serv	Maint: No	100	0	34	24	3	2	7	0	97	
2	Tac	Serv	Maint: Yes	100	0	20	15	5	2	4	0	102	
2	Tac	Serv	Phase: 2/3	100	0	28	21	4	2	5	0	98	
2	Tac	Serv	Phase: 4/5	100	0	19	13	4	2	4	0	103	
2	Tac	Serv	Phase: All	100	0	22	16	4	2	5	0	101	
2	Tac	Unsr	Maint: No		5	4	0		0	8	1	1	1
2	Tac	Unsr	Maint: Yes		2	1	1		0	2	0	0	0
2	Tac	Unsr	Phase: 2/3		4	2	1		0	5	0	1	0
2	Tac	Unsr	Phase: 4/5		2	1	1		0	2	0	0	0
2	Tac	Unsr	Phase: All		2	2	1		0	3	0	1	0
2	Thtr	Serv	Maint: No	8	2	6	28	26	12	0	0	9	1
2	Thtr	Serv	Maint: Yes	0	1	1	7	5	1	0	0	2	0
2	Thtr	Serv	Phase: 2/3	4	3	3	16	17	6	0	0	6	1
2	Thtr	Serv	Phase: 4/5	0	1	1	7	3	1	0	0	2	0
2	Thtr	Serv	Phase: All	2	1	1	11	9	3	0	0	3	1
2	Thtr	Unsr	Maint: No		3	0	2		0	1	0	1	0
2	Thtr	Unsr	Maint: Yes		4	1	4		0	0	1	0	1
2	Thtr	Unsr	Phase: 2/3		7	0	5		0	1	0	1	0
2	Thtr	Unsr	Phase: 4/5		3	2	2		0	0	1	0	1
2	Thtr	Unsr	Phase: All		4	1	3		0	1	1	0	1
3	Tac	Serv	Maint: No	100	0	39	36	6	2	5		90	
3	Tac	Serv	Maint: Yes	100	0	24	20	8	3	6	0	98	
3	Tac	Serv	Phase: 2/3	100	0	31	31	8	3	4	0	93	
3	Tac	Serv	Phase: 4/5	100	0	24	17	8	3	7	0	99	
3	Tac	Serv	Phase: All	100	0	27	23	8	3	6	0	97	
3	Tac	Unsr	Maint: No		3	0	0		0	2	1	2	1
3	Tac	Unsr	Maint: Yes		2	0	1		0	2	0	1	0

**Table E.1—Continued**

Class	SSA			Cust						Rec	SSA	Iss			
	Type	Cond	Phase	Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)		Maint (%)	Rec (%)	Maint (%)	Trans (%)
3	Tac	Unsrv	Phase: 2/3	3	0	0		0	2	0	2	0			
3	Tac	Unsrv	Phase: 4/5	2	0	1			2	0	0	0	0		
3	Tac	Unsrv	Phase: All	3	0	1		0	2	0	1	0			
3	Thtr	Serv	Maint: No	10	3	55	43	31	10	0		27			0
3	Thtr	Serv	Maint: Yes	1	2	0	4	4	1	0	0	3			0
3	Thtr	Serv	Phase: 2/3	5	4	30	22	18	5	0	0	15			0
3	Thtr	Serv	Phase: 4/5	0	2	0	3	3	0			2			0
3	Thtr	Serv	Phase: All	3	3	11	12	9	2	0	0	7			0
3	Thtr	Unsrv	Maint: No	0	0	0		0		0	12	0	0		
3	Thtr	Unsrv	Maint: Yes	0	0	0		0	0	0	0	0	0	0	0
3	Thtr	Unsrv	Phase: 2/3	0	0	0		0	0	0	7	0	0		0
3	Thtr	Unsrv	Phase: 4/5	0		0				0	0	0			
3	Thtr	Unsrv	Phase: All	0	0	0		0	0	0	0	5	0	0	0
4	Tac	Serv	Maint: No	100	0	32	29	2	3	5	1	83			
4	Tac	Serv	Maint: Yes	100	0	22	34	4	2	10	0	77			
4	Tac	Serv	Phase: 2/3	100	0	22	25	4	2	5	1	86			
4	Tac	Serv	Phase: 4/5	100	0	24	38	3	3	11	0	73			
4	Tac	Serv	Phase: All	100	0	23	33	4	2	9	0	78			
4	Tac	Unsrv	Maint: No	0	0	0		0	0	0	0	0	0	0	0
4	Tac	Unsrv	Maint: Yes	1	0	0		1	0	1	1	1	1	1	1
4	Tac	Unsrv	Phase: 2/3	0	0	0		0	0	0	0	0	0	0	0
4	Tac	Unsrv	Phase: 4/5	1	0	0		1	0	1	1	1	1	1	1
4	Tac	Unsrv	Phase: All	1	0	0		0	0	0	1	1	1	1	1
4	Thtr	Serv	Maint: No	13	2	1	22	21	4	1		10			0
4	Thtr	Serv	Maint: Yes	0	1	2	4	3	0	0		1			0
4	Thtr	Serv	Phase: 2/3	6	2	0	12	12	2	1		6			0
4	Thtr	Serv	Phase: 4/5	0	1	2	4	2	0	0		1			0
4	Thtr	Serv	Phase: All	2	1	1	7	6	1	1		3			0
4	Thtr	Unsrv	Maint: No	1	0	0		1	0	0	1	0	0	0	0
4	Thtr	Unsrv	Maint: Yes	0	0	0		0	0	0	0	0	0	0	0
4	Thtr	Unsrv	Phase: 2/3	0	0	0		0	0	0	0	0	0	0	0
4	Thtr	Unsrv	Phase: 4/5	1	0	1		0	0	0	0	0	0	0	0
4	Thtr	Unsrv	Phase: All	0	0	0		0	0	0	0	0	0	0	0
9	Tac	Serv	Maint: No	100	0	30	28	5	2	10	0	91			
9	Tac	Serv	Maint: Yes	100	0	40	25	13	3	17	3	96			
9	Tac	Serv	Phase: 2/3	100	0	30	25	8	3	12	2	91			
9	Tac	Serv	Phase: 4/5	100	0	46	26	14	2	20	3	99			
9	Tac	Serv	Phase: All	100	0	37	26	11	3	15	2	95			
9	Tac	Unsrv	Maint: No	7	47	2		0	51	7	1	7			

**Table E.1—Continued**

Class	SSA Type	Cond	Phase	Cust						Rec Maint	SSA Rec	Iss		
				Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)			Maint (%)	Maint (%)	Trans (%)
9	Tac	Unsr	Maint: Yes	8	39	2		0	46	1	1	4		
9	Tac	Unsr	Phase: 2/3	7	45	2		0	50	4	1	6		
9	Tac	Unsr	Phase: 4/5	8	36	2		0	44	1	1	4		
9	Tac	Unsr	Phase: All	8	41	2		0	48	3	1	5		
9	Thtr	Serv	Maint: No	10	0	1	13	32	7	0	1	17		2
9	Thtr	Serv	Maint: Yes	4	2	5	10	25	12	0	11	11		9
9	Thtr	Serv	Phase: 2/3	9	1	1	11	31	9	0	4	17		6
9	Thtr	Serv	Phase: 4/5	1	2	9	11	22	13	0	13	7		9
9	Thtr	Serv	Phase: All	6	1	4	11	27	10	0	8	13		7
9	Thtr	Unsr	Maint: No	16	13	21		10	2	10	20	12	22	
9	Thtr	Unsr	Maint: Yes	21	7	18		10	1	7	23	20	16	
9	Thtr	Unsr	Phase: 2/3	17	11	21		8	2	7	20	11	21	
9	Thtr	Unsr	Phase: 4/5	21	6	17		13	0	9	25	26	15	
9	Thtr	Unsr	Phase: All	19	9	19		10	1	8	22	17	18	

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## Appendix F. Planning Factors by Non-Class IX and Class IX for Notional Retrograde Phases

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Table F.1 provides a detailed breakout of all planning factors split by non-Class IX and Class IX, including transactions not otherwise included in planning factors, such as pseudo-receipts and changes to on hand (ohdelta). These factors simplify the factors by class but closely match the individual classes. Appendix A explains the transaction types.

**Table F.1. Planning Factors by Class IX Versus Non-Class IX**

Class IX	SSA Type	Cond	Phase	Cust Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)	Rec Maint (%)	SSA Rec (%)	Iss Maint (%)	Trans (%)
0	Tac	Serv	Maint: No	100	0	33	28	3	2	5	0	88		
0	Tac	Serv	Maint: Yes	100	0	21	27	4	2	8	0	86		
0	Tac	Serv	Phase: 2/3	100	0	25	25	4	2	5	0	90		
0	Tac	Serv	Phase: 4/5	100	0	22	29	4	2	9	0	84		
0	Tac	Serv	Phase: All	100	0	23	28	4	2	7	0	86		
0	Tac	Unsr	Maint: No		2	2	0	0	0	4	0	1	0	
0	Tac	Unsr	Maint: Yes		1	1	0	0	0	1	1	1	1	
0	Tac	Unsr	Phase: 2/3		2	1	0	0	0	2	0	1	0	
0	Tac	Unsr	Phase: 4/5		2	1	0	0	0	1	1	1	1	
0	Tac	Unsr	Phase: All		2	1	0	0	0	1	1	1	1	
0	Thtr	Serv	Maint: No	11	2	8	26	23	7	1	0	12		1
0	Thtr	Serv	Maint: Yes	0	1	1	5	3	1	0	0	2		0
0	Thtr	Serv	Phase: 2/3	5	2	4	14	14	4	0	0	7		1
0	Thtr	Serv	Phase: 4/5	0	1	1	4	2	1	0	0	1		0
0	Thtr	Serv	Phase: All	2	1	2	8	7	2	0	0	3		0
0	Thtr	Unsr	Maint: No		1	0	1	0	0	1	0	1	0	0
0	Thtr	Unsr	Maint: Yes		2	1	1	0	0	0	0	0	0	0
0	Thtr	Unsr	Phase: 2/3		2	0	2	0	0	1	0	1	0	0
0	Thtr	Unsr	Phase: 4/5		1	2	1	0	0	0	0	0	0	0
0	Thtr	Unsr	Phase: All		2	1	1	0	0	1	0	0	0	0
1	Tac	Serv	Maint: No	100	0	30	28	5	2	10	0	91		
1	Tac	Serv	Maint: Yes	100	0	40	25	13	3	17	3	96		
1	Tac	Serv	Phase: 2/3	100	0	30	25	8	3	12	2	91		
1	Tac	Serv	Phase: 4/5	100	0	46	26	14	2	20	3	99		
1	Tac	Serv	Phase: All	100	0	37	26	11	3	15	2	95		
1	Tac	Unsr	Maint: No		7	47	2	0	51	7	1	7		

**Table F.1—Continued**

Class IX	SSA Type	Cond	Phase	Cust Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)	Rec Maint (%)	SSA Rec (%)	Iss Maint (%)	Trans (%)
1	Tac	Unsrv	Maint: Yes	8	39	2	0	46	1	1	4			
1	Tac	Unsrv	Phase: 2/3	7	45	2	0	50	4	1	6			
1	Tac	Unsrv	Phase: 4/5	8	36	2	0	44	1	1	4			
1	Tac	Unsrv	Phase: All	8	41	2	0	48	3	1	5			
1	Thtr	Serv	Maint: No	10	0	1	13	32	7	0	1	17		2
1	Thtr	Serv	Maint: Yes	4	2	5	10	25	12	0	11	11		9
1	Thtr	Serv	Phase: 2/3	9	1	1	11	31	9	0	4	17		6
1	Thtr	Serv	Phase: 4/5	1	2	9	11	22	13	0	13	7		9
1	Thtr	Serv	Phase: All	6	1	4	11	27	10	0	8	13		7
1	Thtr	Unsrv	Maint: No	16	13	21	10		2	10	20	12	22	
1	Thtr	Unsrv	Maint: Yes	21	7	18	10		1	7	23	20	16	
1	Thtr	Unsrv	Phase: 2/3	17	11	21	8		2	7	20	11	21	
1	Thtr	Unsrv	Phase: 4/5	21	6	17	13		0	9	25	26	15	
1	Thtr	Unsrv	Phase: All	19	9	19	10		1	8	22	17	18	

## Appendix G. Planning Factors by Class and Region for Notional Retrograde Phases

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Table G.1 breaks out the planning factors for the notional planning phases for Afghanistan. Table G.2 does the same for Iraq, while Table G.3 provides those for Kuwait.

**Table G.1. Planning Factors for Afghanistan: Notional Phases**

Class	SSA			Cust						Rec	SSA Rec (%)	Iss		
	Type	Cond	Phase	Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)			Maint (%)	Maint (%)	Trans (%)
2	Tac	Serv	Maint: No	100	0	27	13	5	1	5	0	107		
2	Tac	Serv	Maint: Yes	100	0	12	7	1	0	3	0	103		
2	Tac	Serv	Phase: 2	100	1	17	8	5	1	6	0	99		
2	Tac	Serv	Phase: 3	100	0	19	10	1	0	3	0	104		
2	Tac	Serv	Phase: 4/5	100	0	12	7	1	0	3	0	103		
2	Tac	Serv	Phase: All	100	0	14	7	1	0	3	0	103		
2	Tac	Unsr	Maint: No		4	1	0	0	0	5	0	1	0	
2	Tac	Unsr	Maint: Yes		1	1	0	0	0	1	0	0	0	
2	Tac	Unsr	Phase: 2		4	1	0	0	0	5	1	1	1	
2	Tac	Unsr	Phase: 3		3	1	0	0	0	3	0	0	0	
2	Tac	Unsr	Phase: 4/5		1	0	0	0	0	1	0	1	0	
2	Tac	Unsr	Phase: All		1	1	0	0	0	2	0	1	0	
3	Tac	Serv	Maint: No	100	0	18	8	9	2	4		103		
3	Tac	Serv	Maint: Yes	100	0	14	8	1	0	4	0	101		
3	Tac	Serv	Phase: 2	100	0	20	8	10	3	4		102		
3	Tac	Serv	Phase: 3	100	0	11	8	2	0	2	0	100		
3	Tac	Serv	Phase: 4/5	100	0	15	8	2	0	5		102		
3	Tac	Serv	Phase: All	100	0	15	8	2	0	4	0	101		
3	Tac	Unsr	Maint: No		1	1	2			2	0	4	0	
3	Tac	Unsr	Maint: Yes		1	0	0			1	0	0	0	
3	Tac	Unsr	Phase: 2		1	1	2			1	1	6	1	
3	Tac	Unsr	Phase: 3		1	0	0			1	0	0	0	
3	Tac	Unsr	Phase: 4/5		1	0	0			0	0	0	0	
3	Tac	Unsr	Phase: All		1	0	0			1	0	1	0	
4	Tac	Serv	Maint: No	100	0	28	12	2	0	9	15	100		
4	Tac	Serv	Maint: Yes	100	0	17	36	3	1	12	0	70		
4	Tac	Serv	Phase: 2	100	0	40	24	3	0	20	15	71		
4	Tac	Serv	Phase: 3	100		12	12	0		8	0	97		

**Table G.1—Continued**

Class	SSA			Cust							Rec	SSA	Iss		
	Type	Cond	Phase	Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)			Maint (%)	Rec (%)	Maint (%)
4	Tac	Serv	Phase: 4/5	100	0	18	38	3	1	12	0	68			
4	Tac	Serv	Phase: All	100	0	18	34	3	1	12	0	72			
4	Tac	Unsrv	Maint: No		0	0	0			0	0	1	1	1	
4	Tac	Unsrv	Maint: Yes		1	0	0			0	1	1	1	1	
4	Tac	Unsrv	Phase: 2		0	0	0			1	1	1	1	2	
4	Tac	Unsrv	Phase: 3		0	0	1			0	0	0	0	0	
4	Tac	Unsrv	Phase: 4/5		1	0	0			0	1	1	1	1	
4	Tac	Unsrv	Phase: All		1	0	0			0	1	1	1	1	
9	Tac	Serv	Maint: No	100	0	19	8	7	0	7	0	99			
9	Tac	Serv	Maint: Yes	100	0	32	16	4	0	16	2	100			
9	Tac	Serv	Phase: 2	100	0	17	9	7	1	5	0	98			
9	Tac	Serv	Phase: 3	100	0	22	8	3	0	12	3	99			
9	Tac	Serv	Phase: 4/5	100	0	33	18	4	0	16	2	101			
9	Tac	Serv	Phase: All	100	0	30	15	4	0	15	2	100			
9	Tac	Unsrv	Maint: No		2	21	0			22	0	0	0	0	
9	Tac	Unsrv	Maint: Yes		5	20	2			25	1	0	4		
9	Tac	Unsrv	Phase: 2		3	21	1			22	1	0	1		
9	Tac	Unsrv	Phase: 3		2	23	1			27	1	0	4		
9	Tac	Unsrv	Phase: 4/5		5	19	2			24	1	0	3		
9	Tac	Unsrv	Phase: All		4	20	2			25	1	0	3		

**Table G.2. Planning Factors for Iraq: Notional Phases**

Class	SSA			Cust							Rec	SSA	Iss		
	Type	Cond	Phase	Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)			Maint (%)	Rec (%)	Maint (%)
2	Tac	Serv	Maint: No	100	0	36	28	2	2	7	0	94			
2	Tac	Serv	Maint: Yes	100	0	29	23	9	3	6	0	100			
2	Tac	Serv	Phase: 2	100	0	34	32	1	1	5	0	93			
2	Tac	Serv	Phase: 3	100	0	30	23	6	3	6	0	96			
2	Tac	Serv	Phase: 4/5	100	0	29	24	10	3	6	0	102			
2	Tac	Serv	Phase: All	100	0	30	24	7	3	6	0	99			
2	Tac	Unsrv	Maint: No		6	5	1	0		9	1	1	1	1	
2	Tac	Unsrv	Maint: Yes		2	2	1	0		3	0	0	0	0	
2	Tac	Unsrv	Phase: 2		6	6	1	0		10	1	1	1	1	
2	Tac	Unsrv	Phase: 3		3	2	1	0		4	1	1	1	1	
2	Tac	Unsrv	Phase: 4/5		3	2	1	0		3	0	0	0	0	

**Table G.2—Continued**

Class	SSA			Cust						Rec	SSA	Iss			
	Type	Cond	Phase	Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)			Maint (%)	Rec (%)	Maint (%)	Trans (%)
2	Tac	Unsrv	Phase: All	3	2	1	0	4	0	1	0				
3	Tac	Serv	Maint: No	100	0	45	45	5	2	5	85				
3	Tac	Serv	Maint: Yes	100	0	30	28	13	4	7	0	96			
3	Tac	Serv	Phase: 2	100	0	42	48	3	2	6	83				
3	Tac	Serv	Phase: 3	100	0	34	36	11	3	3	0	94			
3	Tac	Serv	Phase: 4/5	100	0	31	25	14	4	10	0	97			
3	Tac	Serv	Phase: All	100	0	34	32	11	3	7	0	94			
3	Tac	Unsrv	Maint: No	3	0	0	0	2	1	2	1				
3	Tac	Unsrv	Maint: Yes	4	0	1	0	3	0	1	0				
3	Tac	Unsrv	Phase: 2	2	0	0		1	1	1	2	1			
3	Tac	Unsrv	Phase: 3	4	0	0	0	2	0	0	1	0			
3	Tac	Unsrv	Phase: 4/5	4	0	1		3	0	0	0	0			
3	Tac	Unsrv	Phase: All	4	0	1	0	2	0	0	1	0			
4	Tac	Serv	Maint: No	100	0	33	35	3	3	4	0	77			
4	Tac	Serv	Maint: Yes	100	0	33	30	6	4	4	0	93			
4	Tac	Serv	Phase: 2	100	0	16	27	1	1	3	75				
4	Tac	Serv	Phase: 3	100	0	26	30	6	3	3	0	86			
4	Tac	Serv	Phase: 4/5	100	0	53	36	5	6	7	0	100			
4	Tac	Serv	Phase: All	100	0	33	32	5	3	4	0	88			
4	Tac	Unsrv	Maint: No	0	0	0	0	0	0	0	0	0			
4	Tac	Unsrv	Maint: Yes	2	0	0	1	0	0	0	0	0			
4	Tac	Unsrv	Phase: 2	0	0	0	0	0	0	0	0	0			
4	Tac	Unsrv	Phase: 3	0	0	0	0	0	0	0	0	0			
4	Tac	Unsrv	Phase: 4/5	3	0	0	1	1	0	0	0	0			
4	Tac	Unsrv	Phase: All	1	0	0	0	0	0	0	0	0			
9	Tac	Serv	Maint: No	100	0	31	30	5	2	10	1	90			
9	Tac	Serv	Maint: Yes	100	0	44	29	18	4	18	3	95			
9	Tac	Serv	Phase: 2	100	0	26	29	3	1	8	0	86			
9	Tac	Serv	Phase: 3	100	0	34	26	12	4	14	2	92			
9	Tac	Serv	Phase: 4/5	100	0	56	33	22	3	23	4	99			
9	Tac	Serv	Phase: All	100	0	39	29	13	3	15	2	93			
9	Tac	Unsrv	Maint: No	8	49	2	0	54	7	1	7				
9	Tac	Unsrv	Maint: Yes	10	47	2	0	56	1	2	4				
9	Tac	Unsrv	Phase: 2	7	48	3	0	51	8	1	9				
9	Tac	Unsrv	Phase: 3	9	47	1	0	54	3	2	5				
9	Tac	Unsrv	Phase: 4/5	11	49	3	0	60	1	2	4				
9	Tac	Unsrv	Phase: All	9	48	2	0	55	4	2	5				

**Table G.3. Planning Factors for Kuwait: Notional Phases**

Class	SSA Type	Cond	Phase	Cust							Rec Maint (%)	SSA Rec (%)	Iss Maint (%)	Iss Trans (%)
				Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)				
2	Thtr	Serv	Maint: No	8	2	6	28	26	12	0	0	9		1
2	Thtr	Serv	Maint: Yes	0	1	1	7	5	1	0	0	2		0
2	Thtr	Serv	Phase: 2	13	1	10	40	23	16	0	0	12		2
2	Thtr	Serv	Phase: 3	1	3	0	9	15	3	0	0	4		1
2	Thtr	Serv	Phase: 4/5	0	1	1	7	3	1	0	0	2		0
2	Thtr	Serv	Phase: All	2	1	1	11	9	3	0	0	3		1
2	Thtr	Unsrv	Maint: No		3	0	2		0	1	0	1	0	0
2	Thtr	Unsrv	Maint: Yes		4	1	4		0	0	1	0	1	0
2	Thtr	Unsrv	Phase: 2		3	0	0		0	3	0	1	0	0
2	Thtr	Unsrv	Phase: 3		8	0	6		0	0	0	0	0	0
2	Thtr	Unsrv	Phase: 4/5		3	2	2		0	0	1	0	1	0
2	Thtr	Unsrv	Phase: All		4	1	3		0	1	1	0	1	0
3	Thtr	Serv	Maint: No	10	3	55	43	31	10	0		27		0
3	Thtr	Serv	Maint: Yes	1	2	0	4	4	1	0	0	3		0
3	Thtr	Serv	Phase: 2	14	1	73	63	29	14	0		45		0
3	Thtr	Serv	Phase: 3	2	5	0	8	14	2	0	0	4		0
3	Thtr	Serv	Phase: 4/5	0	2	0	3	3	0			2		0
3	Thtr	Serv	Phase: All	3	3	11	12	9	2	0	0	7		0
3	Thtr	Unsrv	Maint: No		0	0	0		0		0	12	0	0
3	Thtr	Unsrv	Maint: Yes		0	0	0		0	0	0	0	0	0
3	Thtr	Unsrv	Phase: 2		1	0	0		0		1	16	1	
3	Thtr	Unsrv	Phase: 3		0	0	0		0	0	0	0	0	0
3	Thtr	Unsrv	Phase: 4/5		0		0				0	0	0	0
3	Thtr	Unsrv	Phase: All		0	0	0		0	0	0	5	0	0
4	Thtr	Serv	Maint: No	13	2	1	22	21	4	1		10		0
4	Thtr	Serv	Maint: Yes	0	1	2	4	3	0	0		1		0
4	Thtr	Serv	Phase: 2	21	0	1	33	26	7	1		20		1
4	Thtr	Serv	Phase: 3	2	2	0	6	8	1	1		2		0
4	Thtr	Serv	Phase: 4/5	0	1	2	4	2	0	0		1		0
4	Thtr	Serv	Phase: All	2	1	1	7	6	1	1		3		0
4	Thtr	Unsrv	Maint: No		1	0	0		1	0	0	1	0	0
4	Thtr	Unsrv	Maint: Yes		0	0	0		0	0	0	0	0	0

**Table G.3—Continued**

Class	SSA Type	Cond	Phase	Cust						Rec Maint	SSA Rec (%)	Iss Maint (%)	Iss Trans (%)	
				Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)					
4	Thtr	Unsrv	Phase: 2		1	0	0		1	0	0	1	0	0
4	Thtr	UnsrV	Phase: 3		0	0	0		0	0	0	0	0	0
4	Thtr	UnsrV	Phase: 4/5		1	0	1		0		0	0	0	0
4	Thtr	UnsrV	Phase: All		0	0	0		0	0	0	0	0	0
9	Thtr	Serv	Maint: No	10	0	1	13	32	7	0	1	17		2
9	Thtr	Serv	Maint: Yes	4	2	5	10	25	12	0	11	11		9
9	Thtr	Serv	Phase: 2	13	0	1	16	35	8	0	0	20		3
9	Thtr	Serv	Phase: 3	7	1	1	8	29	10	1	6	15		7
9	Thtr	Serv	Phase: 4/5	1	2	9	11	22	13	0	13	7		9
9	Thtr	Serv	Phase: All	6	1	4	11	27	10	0	8	13		7
9	Thtr	UnsrV	Maint: No		16	13	21		10	2	10	20	12	22
9	Thtr	UnsrV	Maint: Yes		21	7	18		10	1	7	23	20	16
9	Thtr	UnsrV	Phase: 2		15	15	21		10	2	14	18	17	19
9	Thtr	UnsrV	Phase: 3		19	8	21		7	2	4	21	9	21
9	Thtr	UnsrV	Phase: 4/5		21	6	17		13	0	9	25	26	15
9	Thtr	UnsrV	Phase: All		19	9	19		10	1	8	22	17	18

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## Appendix H. Planning Factors by Class and Region for Operation Iraqi Freedom and Operation New Dawn Phases

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Table H.1 breaks out the planning factors for Afghanistan. Table H.2 does the same for Iraq, and Table H.3 covers Kuwait. While the DA does not have an approved phase time line for OEF for use in logistics planning factors, the DA approved phases for OIF/OND was used for this analysis.

**Table H.1. Planning Factors for Afghanistan: OIF Phases**

Class	SSA			Cust Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)	Rec Maint (%)	SSA	Iss	
	Type	Cond	Phase									Rec Rec (%)	Maint (%)	Trans (%)
2	Tac	Serv	Maint: No	100	0	31	14	4	0	3	0	113		
2	Tac	Serv	Maint: Yes	100	0	12	7	1	0	3	0	103		
2	Tac	Serv	Phase: 1–3	100	0	26	5	3	0	13		103		
2	Tac	Serv	Phase: 4	100	0	15	7	1	0	3	0	103		
2	Tac	Serv	Phase: 5	100	0	13	7	1	0	3	0	104		
2	Tac	Serv	Phase: All	100	0	14	7	1	0	3	0	103		
2	Tac	Unsrv	Maint: No		4	1	0	0		5	0	1	0	
2	Tac	Unsrv	Maint: Yes		1	1	0	0		1	0	0	0	
2	Tac	Unsrv	Phase: 1–3		8	4	0			12	1	1	0	
2	Tac	Unsrv	Phase: 4		2	1	0	0		3	0	0	0	
2	Tac	Unsrv	Phase: 5		1	0	0	0		1	0	1	0	
2	Tac	Unsrv	Phase: All		1	1	0	0		2	0	0	0	
3	Tac	Serv	Maint: No	100	0	16	9	9	0	4		103		
3	Tac	Serv	Maint: Yes	100	0	14	8	1	0	4	0	101		
3	Tac	Serv	Phase: 1–3	100		41	17	11		18		105		
3	Tac	Serv	Phase: 4	100	0	13	7	3	0	3	0	100		
3	Tac	Serv	Phase: 5	100	0	16	9	2	0	5		102		
3	Tac	Serv	Phase: All	100	0	15	8	2	0	4	0	101		
3	Tac	Unsrv	Maint: No		1	1	2			2	0	3	0	
3	Tac	Unsrv	Maint: Yes		1	0	0			1	0	0	0	
3	Tac	Unsrv	Phase: 1–3		1	3				3	1	2	1	
3	Tac	Unsrv	Phase: 4		1	0	0			1	0	1	0	

**Table H.1—Continued**

Class	SSA Type	Cond	Phase	Cust Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)	Rec Maint (%)	SSA Rec (%)	Iss Maint (%)	Iss Trans (%)
3	Tac	Unsrv	Phase: 5	1	0	0				0	0	0	0	0
3	Tac	Unsrv	Phase: All	1	0	0				1	0	1	0	0
4	Tac	Serv	Maint: No	100	0	28	7	1	0	0	15	118		
4	Tac	Serv	Maint: Yes	100	0	17	36	3	1	12	0	70		
4	Tac	Serv	Phase: 1–3	100	4	8	7	4		1		84		
4	Tac	Serv	Phase: 4	100	0	18	24	1	0	23	0	71		
4	Tac	Serv	Phase: 5	100	0	17	40	4	1	6	0	73		
4	Tac	Serv	Phase: All	100	0	18	34	3	1	12	0	72		
4	Tac	Unsrv	Maint: No		0	0	0			0	0	0	1	
4	Tac	Unsrv	Maint: Yes		1	0	0			0	1	1	1	
4	Tac	Unsrv	Phase: 1–3		21	0				0	21	2	21	
4	Tac	Unsrv	Phase: 4		2	0	0			0	2	0	2	
4	Tac	Unsrv	Phase: 5		1	0	0			0	0	1	0	
4	Tac	Unsrv	Phase: All		1	0	0			0	1	1	1	
9	Tac	Serv	Maint: No	100	0	20	8	7	0	8	0	101		
9	Tac	Serv	Maint: Yes	100	0	32	16	4	0	16	2	100		
9	Tac	Serv	Phase: 1–3	100	0	21	9	5	2	11		102		
9	Tac	Serv	Phase: 4	100	0	26	13	4	0	12	4	95		
9	Tac	Serv	Phase: 5	100	0	33	17	4	0	16	1	103		
9	Tac	Serv	Phase: All	100	0	31	15	4	0	15	2	100		
9	Tac	Unsrv	Maint: No		2	20	0	0		21	0	0	0	
9	Tac	Unsrv	Maint: Yes		5	20	2	0		25	1	0	4	
9	Tac	Unsrv	Phase: 1–3		5	30	0	0		33	0	0	0	
9	Tac	Unsrv	Phase: 4		3	21	1	1		26	1	0	5	
9	Tac	Unsrv	Phase: 5		5	20	2	0		23	1	0	3	
9	Tac	Unsrv	Phase: All		4	20	2	0		25	1	0	3	

**Table H.2. Planning Factors for Iraq: OIF Phases**

Class	SSA Type	Cond	Phase	Cust							Rec Maint (%)	SSA Rec (%)	Iss Maint (%)	Trans (%)
				Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)				
2	Tac	Serv	Maint: No	100	0	36	28	2	2	7	0	93		
2	Tac	Serv	Maint: Yes	100	0	29	23	9	3	6	0	100		
2	Tac	Serv	Phase: 1–3	100	0	4	13	1	0	2		91		
2	Tac	Serv	Phase: 4	100	0	28	24	7	2	5	0	96		
2	Tac	Serv	Phase: 5	100	0	39	27	9	5	9	0	109		
2	Tac	Serv	Phase: All	100	0	30	24	7	3	6	0	99		
2	Tac	Unsrv	Maint: No		6	5	1	0		9	1	1	1	
2	Tac	Unsrv	Maint: Yes		2	2	1	0		3	0	0	0	
2	Tac	Unsrv	Phase: 1–3		0	2				0	0	1	0	
2	Tac	Unsrv	Phase: 4		3	2	1	0		4	0	1	0	
2	Tac	Unsrv	Phase: 5		4	3	2	0		4	0	0	0	
2	Tac	Unsrv	Phase: All		3	2	1	0		4	0	1	0	
3	Tac	Serv	Maint: No	100	0	45	45	5	2	5		85		
3	Tac	Serv	Maint: Yes	100	0	30	28	13	4	7	0	96		
3	Tac	Serv	Phase: 1–3	100	0	8	43	2		13		68		
3	Tac	Serv	Phase: 4	100	0	32	33	12	3	5	0	92		
3	Tac	Serv	Phase: 5	100	0	40	29	10	4	14		101		
3	Tac	Serv	Phase: All	100	0	34	32	11	3	7	0	94		
3	Tac	Unsrv	Maint: No		3	0	0	0		2	1	2	1	
3	Tac	Unsrv	Maint: Yes		4	0	1	0		3	0	1	0	
3	Tac	Unsrv	Phase: 1–3		0							1		
3	Tac	Unsrv	Phase: 4		3	0	0	0		2	0	1	0	
3	Tac	Unsrv	Phase: 5		5	1	2			3	0	0	0	
3	Tac	Unsrv	Phase: All		4	0	1	0		2	0	1	0	
4	Tac	Serv	Maint: No	100	0	33	35	3	3	4	0	77		
4	Tac	Serv	Maint: Yes	100	0	33	30	6	4	4	0	93		
4	Tac	Serv	Phase: 1–3	100		6	31	0	0	0		58		
4	Tac	Serv	Phase: 4	100	0	31	31	5	3	3	0	87		
4	Tac	Serv	Phase: 5	100	0	59	39	6	1	18	0	105		
4	Tac	Serv	Phase: All	100	0	33	32	5	3	4	0	88		
4	Tac	Unsrv	Maint: No		0	0	0	0		0	0	0	0	
4	Tac	Unsrv	Maint: Yes		2	0	0	1		0	0	0	0	
4	Tac	Unsrv	Phase: 1–3									1		
4	Tac	Unsrv	Phase: 4		1	0	0	0		0	0	0	0	
4	Tac	Unsrv	Phase: 5		5	0	1			4	0	0	0	
4	Tac	Unsrv	Phase: All		1	0	0	0		0	0	0	0	
9	Tac	Serv	Maint: No	100	0	31	30	5	2	10	1	90		

**Table H.2—Continued**

Class	SSA			Cust							Rec	SSA	Iss		
	Type	Cond	Phase	Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)			Maint (%)	Rec (%)	Maint (%)
9	Tac	Serv	Maint: Yes	100	0	44	29	18	4	18	3	95			
9	Tac	Serv	Phase: 1–3	100	0	5	18	1	0	4	1	82			
9	Tac	Serv	Phase: 4	100	0	35	29	12	3	14	2	92			
9	Tac	Serv	Phase: 5	100	0	65	32	17	4	25	6	100			
9	Tac	Serv	Phase: All	100	0	39	29	13	3	15	2	93			
9	Tac	Unsr	Maint: No		8	49	2		0	54	7	1	7		
9	Tac	Unsr	Maint: Yes		10	47	2		0	56	1	2	4		
9	Tac	Unsr	Phase: 1–3		3	30	1		0	33	4	1	6		
9	Tac	Unsr	Phase: 4		9	47	2		0	53	4	1	5		
9	Tac	Unsr	Phase: 5		12	57	6		0	71	1	2	6		
9	Tac	Unsr	Phase: All		9	48	2		0	55	4	2	5		

**Table H.3. Planning Factors for Kuwait: OIF Phases**

Class	SSA			Cust							Rec	SSA	Iss		
	Type	Cond	Phase	Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)	Return (%)			Maint (%)	Rec (%)	Maint (%)
2	Thtr	Serv	Maint: No	9	2	6	28	26	12	0	0	9			1
2	Thtr	Serv	Maint: Yes	0	1	1	7	5	1	0	0	2			0
2	Thtr	Serv	Phase: 1–3	27	0	1	213	24	7	0		25			0
2	Thtr	Serv	Phase: 4	3	2	2	12	12	5	0	0	5			1
2	Thtr	Serv	Phase: 5	0	1	0	6	3	0	0	0	2			0
2	Thtr	Serv	Phase: All	2	1	1	11	9	3	0	0	3			1
2	Thtr	Unsr	Maint: No		3	0	2		0	1	0	1	0	0	0
2	Thtr	Unsr	Maint: Yes		4	1	4		0	0	1	0	1	0	0
2	Thtr	Unsr	Phase: 1–3		2	0	0		1	2		1			0
2	Thtr	Unsr	Phase: 4		5	1	4		0	1	0	0	0	0	0
2	Thtr	Unsr	Phase: 5		3	2	2		0	0	1	0	1	0	0
2	Thtr	Unsr	Phase: All		4	1	3		0	1	1	0	1	0	0
3	Thtr	Serv	Maint: No	10	3	55	43	31	10	0		28			0
3	Thtr	Serv	Maint: Yes	1	2	0	4	4	1	0	0	3			0
3	Thtr	Serv	Phase: 1–3	41	0		93	26	4			161			
3	Thtr	Serv	Phase: 4	3	3	17	15	13	4	0	0	8			0
3	Thtr	Serv	Phase: 5	0	2	0	3	2	0			2			0
3	Thtr	Serv	Phase: All	3	3	11	12	9	2	0	0	7			0
3	Thtr	Unsr	Maint: No		0	0	0		0		0	12	0	0	0
3	Thtr	Unsr	Maint: Yes		0	0	0		0	0	0	0	0	0	0

**Table H.3—Continued**

Class	SSA			Cust						Rec	SSA	Iss			
	Type	Cond	Phase	Issue (%)	DDS (%)	Retro (%)	FOI (%)	Refer (%)	Retro-R (%)			Maint (%)	Rec (%)	Maint (%)	Trans (%)
3	Thtr	Unsrv	Phase: 1–3	0								22			
3	Thtr	Unsrv	Phase: 4	0	0	0	0	0	0	0	0	5	0	0	0
3	Thtr	Unsrv	Phase: 5	0			0				0	0	0	0	
3	Thtr	Unsrv	Phase: All	0	0	0	0	0	0	0	0	5	0	0	0
4	Thtr	Serv	Maint: No	13	2	1	22	21	4	1		10			0
4	Thtr	Serv	Maint: Yes	0	1	2	4	3	0	0		1			0
4	Thtr	Serv	Phase: 1–3	86	0		109	29	0	2		29			
4	Thtr	Serv	Phase: 4	3	1	1	7	8	2	1		4		1	
4	Thtr	Serv	Phase: 5	0	1	3	5	2	0	0		1		0	
4	Thtr	Serv	Phase: All	2	1	1	7	6	1	1		3		0	
4	Thtr	Unsrv	Maint: No	1	0	0	0	1	0	0		1	0	0	0
4	Thtr	Unsrv	Maint: Yes	0	0	0	0	0		0		0	0	0	0
4	Thtr	Unsrv	Phase: 1–3			0						1			
4	Thtr	Unsrv	Phase: 4	0	0	0	0	0	0	0		0	0	0	0
4	Thtr	Unsrv	Phase: 5	1	0	1	0	0		0		0	0	0	0
4	Thtr	Unsrv	Phase: All	0	0	0	0	0	0	0		0	0	0	0
9	Thtr	Serv	Maint: No	10	0	1	13	32	7	0	1	17		2	
9	Thtr	Serv	Maint: Yes	4	2	5	10	25	12	0	11	11		9	
9	Thtr	Serv	Phase: 1–3	20	0	1	12	28	4	0	0	24		0	
9	Thtr	Serv	Phase: 4	7	1	2	11	30	12	0	6	15		8	
9	Thtr	Serv	Phase: 5	1	1	10	11	19	7	0	13	7		4	
9	Thtr	Serv	Phase: All	6	1	4	11	27	10	0	8	13		7	
9	Thtr	Unsrv	Maint: No	16	13	21		10	2	10	20	12	22		
9	Thtr	Unsrv	Maint: Yes	21	7	18	10	10	1	7	23	20	16		
9	Thtr	Unsrv	Phase: 1–3	11	2	2	11	11	1	1	2	2	9		
9	Thtr	Unsrv	Phase: 4	18	10	22	9	1	7	21	13	20			
9	Thtr	Unsrv	Phase: 5	22	7	13	15	0	12	25	30	13			
9	Thtr	Unsrv	Phase: All	19	9	19	10	1	8	22	17	18			

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## Appendix I. Class V Planning Factors

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This appendix shows retrograde planning factors for ammunition and shows volume by weight for each category and level. TSA and Iraq data are shown to inform drawdown figures but were too unstable to deduce any trends related to sustainment operations.

**Table I.1. Class V Retrograde Amounts**

	Planning Factors				Weight		
	2009 (%)	2010 (%)	2011 (%)	Three- Year Total (%)	2009 (lbs.)	2010 (lbs.)	2011 (lbs.)
<b>Kuwait—TSA</b>							
Cust Issue	8	20	6	12	3,369,372	6,780,142	1,323,664
Destruction/DDS	26	2	3	12	10,770,615	635,131	827,839
Retro	11	21	199	60	4,674,365	6,847,682	47,642,929
FOI	1	160	32	62	258,181	53,168,651	7,600,086
Forward	121	119	133	123	49,440,882	39,601,211	31,737,513
Issue maint/test	14	0	1	6	5,539,735	111,981	313,588
Return maint/test	8	0	0	4	3,431,555	3,421	
Turn in	125	18	9	60	51,088,639	5,941,548	2,172,907
<b>Afghanistan—ASP</b>							
Cust Issue	60	56	45	55	19,001,118	15,892,916	9,418,658
Destruction/DDS	1	0	1	1	186,531	88,841	259,051
Retro	3	3	7	4	1,057,747	745,142	1,552,647
FOI	1	1	1	1	185,376	230,661	177,414
Forward	102	146	121	123	12,735,774	18,369,986	13,684,552
Turn in	3	7	20	8	550,599	1,186,329	1,842,960
<b>Afghanistan—ATHP</b>							
Cust Issue	100	100	100	100	12,541,244	12,565,334	11,330,643
Destruction/DDS	0	0	1	0	1,573	30,133	143,957
Retro	5	6	19	10	603,153	777,768	2,138,875
FOI	18	2	3	8	2,305,113	270,900	396,226
Forward	6	5	10	7	804,886	640,541	1,099,566
Turn in	20	10	18	16	2,505,183	1,215,934	2,069,862

**Table I.1—Continued**

	?? (percent)				?? (??)		
	2009 (%)	2010 (%)	2011 (%)	Grand Total (%)	2009 (??)	2010 (??)	2011 (??)
<b>Iraq—ASP</b>							
Cust Issue	30	39	87	43	2,736,119	1,885,577	2,778,561
Destruction/DDS	4	3	2	3	353,750	135,929	54,528
Excess	36	58	60	46	3,279,690	2,808,372	1,890,728
FOI	15	8	29	15	1,354,944	372,696	908,885
Forward	116	195	1528	112	7,453,616	5,751,253	6,083,154
Issue maint/test	3	0	1	2	309,105		47,351
Return maint/test	2	0	0	1	160,070		
Turn in	28	47	35	35	2,603,180	2,283,085	1,113,352
<b>Iraq—ATHP</b>							
Cust Issue	100	100	100	100	6,435,915	2,948,504	398,115
Destruction/DDS	3	3	0	3	210,826	82,156	
Retro	79	518	265	219	5,099,025	15,270,488	1,054,439
FOI	22	54	2	31	1,406,730	1,589,389	9,437
Forward	44	60	95	51	2,829,182	1,778,396	377,724
Issue maint/test	0	1	0	0	8,586	26,490	
Return maint/test	0	1	0	0	4,457	29,581	
Turn in	148	474	275	252	9,545,281	13,968,625	1,093,440

## Appendix J. Nondoctrinal Support Activities

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### *Regional Retention SSAs*

Regional retention SSAs are not found in doctrine but were established to fill a wartime need. SSAs in each region shipped serviceable retrograde to the designated regional retention SSA, where it was held for distribution within the region or consolidated for shipment to the theater SSA. In both Iraq and Afghanistan, the need emerged to consolidate retrograde shipments before sending them to Kuwait. The regional retention SSAs also had the mission of retaining high-demand items and redistributing them to tactical SSAs in their region. Supply system parameters were set to check availability at the local regional retention SSAs before availability was checked at the theater SSAs. The regional retention SSA may also provide direct supply support to local customers.

### *Retrograde Sort Yard*

An RSY is a nondoctrinal activity established in Iraq and Afghanistan to provide a centralized hub responsible for recovery, redistribution, retrograde, and disposition of excess materiel. For sustainment materiel (Classes II, IIIP, IV, IX), transportation companies will typically move materiel to an RSY, which performs many of the functions of an SSA, sorting through materiel received and preparing it for shipment to DDS or the appropriate ship-to location in CONUS. The RSY is typically staffed by personnel from a combat sustainment support battalion (CSSB), with contractor augmentation. At the time of this writing (fall 2013), there were approximately 93 personnel total at each location. However, this will change according to mission dictates. Equipment is provided by the CSSB and is augmented by contracted materiel handling equipment. In Afghanistan there are, as of this writing, three RSYs: W6U/W56JKU in Kandahar, W6V/W8002V in Bagram, and W75/W56N6 in Mazar-e Sharif. An RSY also operated in Camp Arifjan, Kuwait, during the later stages of OIF.

### *Redistribution Property Assistance Team*

An RPAT is a nondoctrinal activity subordinate to the Army Field Support Brigade's (AFSB's) Army field support battalions (AFSBNs). RPAT yards facilitate the turn-in of theater-provided equipment (TPE) and other Class VII from units, including rolling stock and nonrolling stock. RPATs relieve units of property accountability during the turn-in phase. There are currently nine RPAT yards in Combined Joint Operations Area–Afghanistan. TPE planners and personnel at the RPAT yards are primarily DA civilians or contractors.

### *Theater Ammunition Reclamation Facility*

A TARF is a contractor-operated facility (run by a contractor as part of the Theater Storage Area contract) that processes all ammunition needing inspection or reconfiguration to bring it to a serviceable status for continued use in the AOR or retrograde to CONUS. At the time of this writing, there are two TARFs in theater. One TARF processes all condition codes: E and K are processed through this facility for inspection, reconfiguration of packaging, consolidation of lots, and minor maintenance. The second TARF was used to configure Abrams Reflective Armor Tile. Due to the size of the tile sets, the facility is used to configure the sets to match vehicles. The customer is the theater because the contractors are processing items that are stored in the TSA ASP and managed within SAAS-MOD. The facility provides service to the entire AOR because the Army owns the Title X authority for Class V. The Army maintains stocks for all services. TARF staffing will vary from five to ten, depending on hazardous classification of ammunition being processed. Approximately one to three military or DA civilian personnel are also required to serve as a contract officer representative and to provide quality assurance specialist ammunition surveillance.

### *Tire Assembly Repair Program*

Three National Maintenance Management repair sites called TARPs were operational at AFSB locations in Qatar, Kuwait, and Balad. Repairs at these sites were funded by the U.S. Army TACOM Life-Cycle Management Command (TACOM) under the U.S. Army Sustainment Command's Global Maintenance and Supply Services contract with ITT Industries for one-year increments. Qatar and Kuwait operated 24 hours per day, seven days per week, and Balad operated 12 hours per day, six days per week. The contractual repair quantities were 1,500 in Balad; 2,000 in Qatar; and 3,500 in Kuwait. All three sites accepted local SSA unserviceables for repair and return to Army Working Capital Fund wholesale stocks. Kuwait and Balad also performed retail-level repairs for convoys passing through the area that required emergency wheel assembly repair. Two TARPs also operated in Afghanistan, at Kandahar and Bagram. These operations were similar to those mentioned above except that the tires were returned to the retail level for redistribution within Afghanistan.

## Appendix K. Selected Quotes from Retrograde Doctrine

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The following is a selection of applicable quotes from the ADRP 4-0 (FM 4-0), 2012:

3-127. Another aspect of distribution is retrograde of materiel. Retrograde of materiel is the return of materiel from the owning/using unit back through the distribution system to the source of supply, directed ship-to location, and/or point of disposal [ATTP 4-0.1, 2011]. Retrograde includes turn-in/classification, preparation, packing, transporting, and shipping. To ensure these functions are properly executed, commanders must enforce supply accountability and discipline and utilize the proper packing materials. Retrograde of materiel can take place as part of theater distribution operations and as part of redeployment operations. Retrograde of materiel must be continuous and not be allowed to build up at supply points/nodes.

3-128. Early retrograde planning is essential and necessary to preclude the loss of materiel assets, minimize environmental impact, and maximize use of transportation capabilities. Planners must consider environmental issues when retrograding hazardous materiel.

3-129. Contractor or HNS may be used in the retrograde of materiel. This support is planned and negotiated early in the operation. HNS must be identified early enough to ensure they are properly screened and present no security risk. Leaders at all levels are responsible for the adherence of all policies and safety measures by contractors and HNS.

3-130. Retrograde materiel flows through the distribution system from the tactical to strategic levels. Retrograde materiel is consolidated at the lowest supply support activity and reported up through the support operations for distribution instructions. When released by the maneuver commander, USAMC assumes responsibility for providing disposition instructions, accounting, and shipment of retrograde materiel from the theater.

3-131. An approved military customs inspection program must be in place prior to redeployment to preclear not only redeployment materiel but also the shipment of battle damaged equipment out of theater. The Theater Army is responsible for establishing the customs inspection program to perform U.S. customs preclearance and United States Department of Agriculture inspection and wash down on all materiel retrograded to the United States in accordance with DTR 4500.9-R.

The following is a selection of applicable quotes from the ATTP 4-0.1 (FM 100-10-1), 2011:

2-44. Under certain circumstances (e.g., major unit rotations and redeployments in conjunction with exercises and contingency operations) cargo and personnel returning to the US can be “pre-cleared” (i.e., inspected/certified at the origin instead of at the US border). When deemed to be beneficial to the DOD, US Customs and Border Protection (CBP), and US Department of Agriculture (USDA), pre-clearance programs may be established. These pre-clearance programs will be initiated only when the GCC, U.S. Transportation Command, and the respective US agency or agencies explicitly agree to their establishment.

The program must be in place prior to the shipment of battle damaged equipment back to CONUS for repair. The unit commander identified for movement (deployment or redeployment) must ensure that unit personnel, equipment, and materiel are in compliance with customs and agricultural requirements for that area and according to DOD Regulation 4500.9-R, *Defense Transportation Regulation*, part V.

2-45. Once preclearance procedures have been established, the theater army is normally responsible for establishing procedures and executing preclearance, inspection, and wash down on all materiel retrograded to the United States. This program must be in place prior to retrograde to preclear not only retrograde materiel but also the shipment of battle-damaged equipment back to CONUS for repair. The unit commander identified for movement (deployment or redeployment) must ensure that unit personnel, equipment, and materiel are in compliance with customs and agricultural requirements for that area and according to DOD Regulation 4500.9-R, *Defense Transportation Regulation (DTR)*, part V.

2-46. Meeting CBP and USDA standards is [sic] the obligation of each individual and commander. Historically, military police conducted and authenticated customs preclearance's under the supervision of the CBP and the USDA. Military police were provided guidance, informational materials, and training by the USDA Animal and Plant Health Inspection Service (APHIS). APHIS additionally provided personnel to assist in preclearance's and trained DOD personnel in how to conduct inspections of personnel and in the inspection, cleaning, and disinfecting of materiel. Military police provide a critical capability of training customs inspectors to support the combatant commander's rotation of forces in and out of theater.

2-47. Commanders must initiate aggressive programs to ensure that pests and disease are not included in shipments of general cargo, vehicles, or other types of containers. When it is known that significant quantities of retrograde materiel will accumulate for movement, the theater army must request Armed Forces Pest Management Board authority to place the provisions of DOD Regulation 4500.9-R, part V, into effect for clearance of shipments at specific points of origin. The Armed Forces Pest Management Board recommends policy, provides guidance, and coordinates the exchange of information on all matters related to pest management throughout DOD. The Armed Forces Pest Management Board's mission is to ensure that environmentally sound and effective programs are present to prevent pests and disease vectors from adversely affecting DOD operations.

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